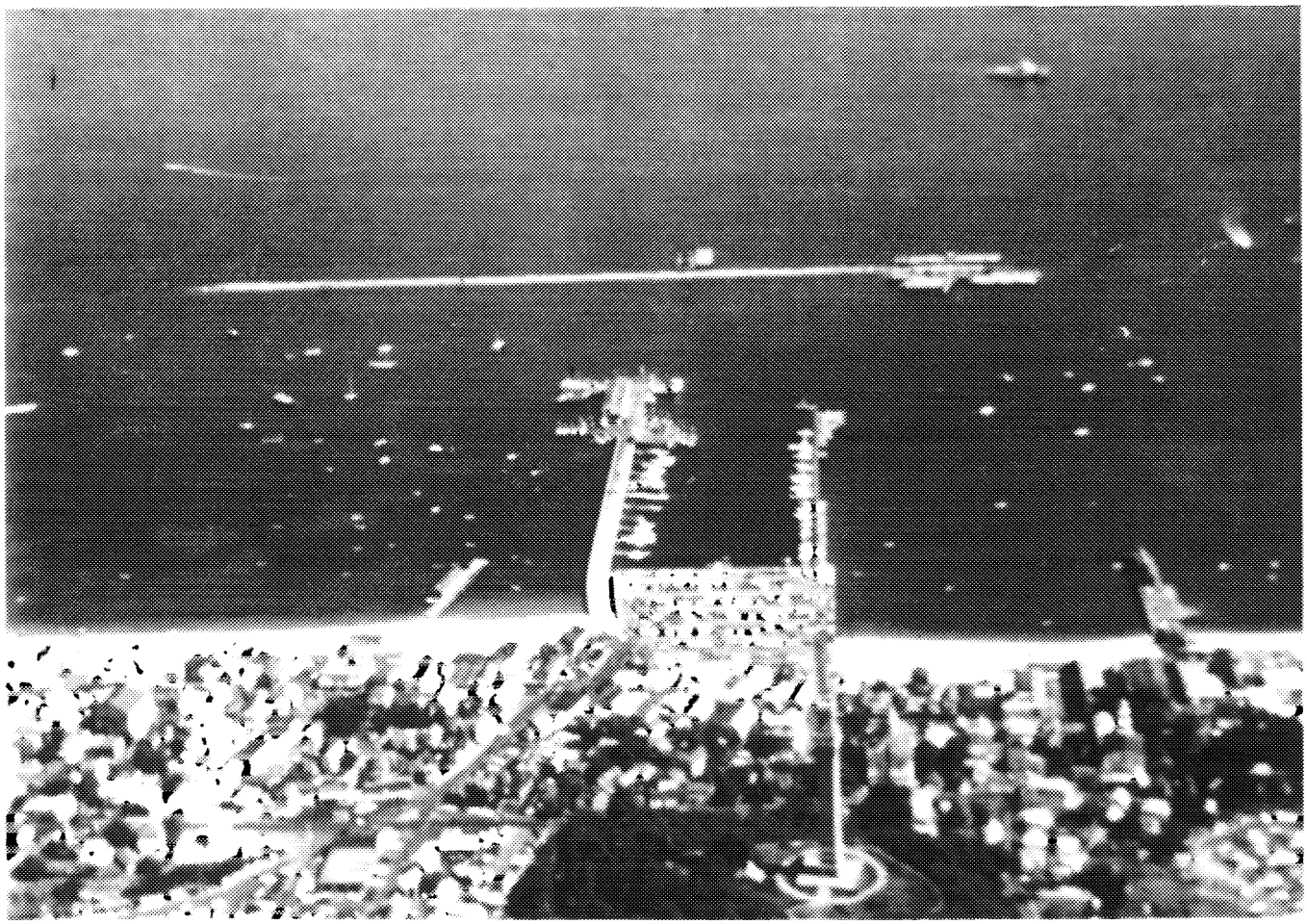
Provincetown Harbor, Massachusetts
Detailed Project Report & Environmental Assessment

Navigation Improvement Project



April 1990

US Army Corps
of Engineers
New England Division

PROVINCETOWN HARBOR
PROVINCETOWN, MASSACHUSETTS

NAVIGATION PROJECT
DETAILED PROJECT REPORT

APRIL 1990

ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION
WALTHAM, MASSACHUSETTS

SYLLABUS

This report provides the results of a study which addresses the navigational needs and the development of possible solutions to the navigation problems at Provincetown Harbor, Massachusetts. The study was initiated at the request of the Selectmen of Provincetown and was performed under the continuing authority contained in Section 107 of the River and Harbor Act of 1960.

Provincetown Harbor is located on the northerly land arm that forms Cape Cod Bay. The study area is about 53 statute miles southeast of Boston. Over the past ten years Provincetown Harbor has consistently maintained its New England ranking as the 7th highest in gross fish tonnage landings. The study area is home to 42 commercial fishing boats as well as 386 registered recreational boats. Commercial vessels who daily utilize Provincetown's inner harbor facilities frequently experience tidal delays and mooring damages from shifting shoal areas and high intensity winds and waves. Approximately $142,000 in annual delays and damages have been attributed to sand shoaling, tidal delays and high winds and waves.

This report describes the plan formulation process for development and evaluation of possible harbor improvement alternatives, which will reduce or eliminate the navigation problems affecting the commercial fishing fleet. The formulation process identified three alternative harbor improvement plans that merited further detailed study (see Table 1, page 12). Of these alternatives, the establishment of a 2000 ft. long, 250 foot wide by 13 ft. deep at mean low water (MLW) Federal channel would provide a high degree of navigation safety for the Provincetown commercial fishing fleet. This plan yields the highest net economic benefits of all the alternatives studied, while having no significant effects on the harbor environment and minimal social effects. Because this plan offers a high degree of safe navigation for the commercial fleet and also compliments state, local and private goals for the harbor, the plan has received wide local support.

The proposed Federal improvement was designed for safe, two-way navigation of boats to and from MacMillan Wharf. The channel limits terminate in deep water just east of the existing Federal breakwater. The material to be removed from the channel would be hydraulically dredged and pumped onto the adjacent beach to the northeast for disposal. The dredged material is mostly medium graded sand, making it very suitable for beach disposal. Maintenance of the project would be expected every 20 years and would be a Federal responsibility, contingent upon the availability of maintenance funds, the continuing justification of the project and the environmental acceptability of required maintenance activities.

The recommended Federal channel plan is economically justified and maximizes net economic benefits. The estimated first cost of the proposed Federal channel is $282,000 with a benefit to cost ratio of 1.1. During the review of this draft document, the state sponsor, the Commonwealth of Massachusetts, in cooperation with the town of Provincetown, will need to establish procedures and commitments for meeting *cost-sharing responsibilities. The estimated non-Federal cost of the project is $56,400.* The Federal government would share 80 percent ($225,600) of the project cost.

The Division Engineer recommends that, subject to the conditions of non-Federal cooperation outlined in this report, the selected plan of navigation improvement for Provincetown Harbor, Massachusetts be adopted.

PROVINCETOWN HARBOR, MASSACHUSETTS

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NAVIGATION PROJECT
DETAILED PROJECT REPORT

I. INTRODUCTION

This Detailed Project Report (DPR) reports upon the completed result of an engineering, environmental and economic feasibility study of navigation improvements to Provincetown Harbor, Massachusetts. This study was limited to the inner harbor area of Provincetown.

Provincetown is located on the northerly portion land arm that forms Cape Cod Bay, (see Plate 1). The study area is about 53 statute miles southeast of the city of Boston and 35 miles northeast of the Cape Cod Canal. The harbor is extensively used by recreational boaters and fishermen for both anchorage and marine services. This investigation and DPR were initiated in response to a request from the Town of Provincetown Selectmen. The Selectmen requested a Corps of Engineers investigation to determine if the following harbor improvements were warranted:

- A Federal access channel to the town pier.
- A turning basin to facilitate the flow of vessel traffic
- A protective structure within the harbor to protect the fishing fleet from southwest storm waves.

This study examined the economic justification of Federal involvement in providing navigation improvements to Provincetown Harbor. This study relied upon information obtained from the town of Provincetown, the U.S. Coast Guard and concerned fishermen. The first phase of effort consisted of a reconnaissance investigation which determined that further Federal study in providing navigation improvements to Provincetown Harbor was warranted. The reconnaissance report concluded that initiation of a detailed feasibility study was justified.

This DPR presents the findings and recommendations of the feasibility study which examined alternative plans of improvements to existing conditions in the harbor.

Study Authority

Following the request for assistance from the Selectmen of Provincetown, this DPR was prepared under the authority and provisions of Section 107 of the 1960 Rivers and Harbors Act, as amended.

Scope of Study

The geographic scope of this study is Provincetown's inner harbor area and other areas possibly affected by the project including proposed disposal sites. This study was performed at the level of detail required to permit optimum plan selection and determination of feasibility. Study scope included the following:

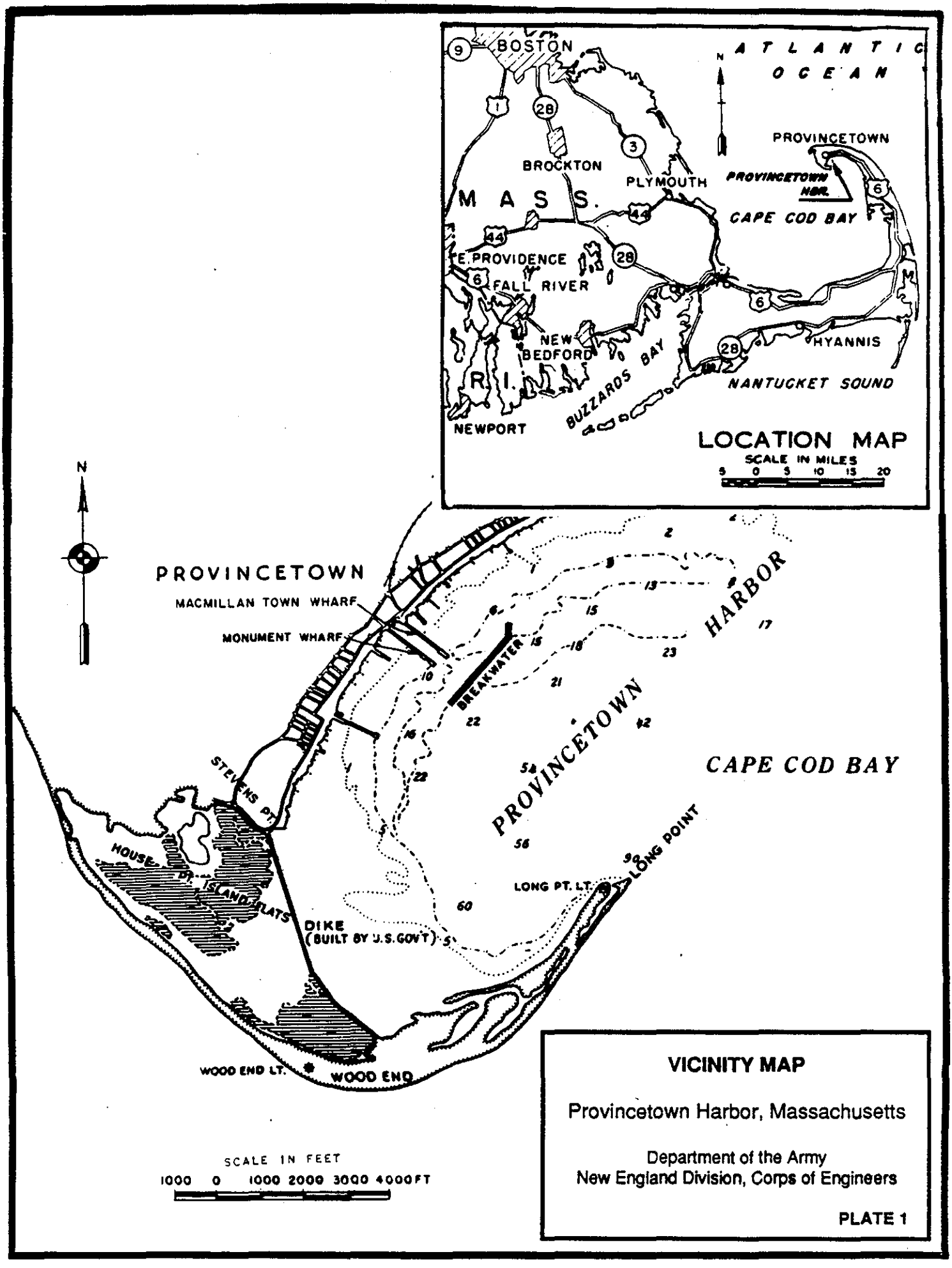
- Determination of the navigational problems and needs of the area;
- Gathering information and preparation of aerial maps;
- Identification of existing conditions and historical trends;
- Holding meetings with the public to coordinate the formulation, evaluation and determination of support of various solutions;
- Determination of the most probable future condition without Federal Navigation Improvements;
- Evaluation of the engineering, environmental, economic and social effects of alternative plans with respect to existing and future conditions;
- Recommendation of implementable improvements which were found economically and engineering feasible, environmentally acceptable and socially beneficial in accordance with appropriate legislation and current Army policy.

Study Participants and Coordination

Close coordination and cooperation between the Corps of Engineers with other Federal agencies, state agencies, Provincetown officials, local commercial fishermen, sport fishermen, businessmen and interested individuals was maintained. Public involvement was actively pursued. It included numerous meetings with local officials and other interests to obtain information directly from the prospective users of the proposed project. Based on information obtained, planning objectives and constraints were identified. See Appendix 3 for all pertinent correspondence.

In early November 1983, town officials from Provincetown met with Corps representatives to discuss the feasibility study in light of imposed court restriction on MacMillan wharf. Court restrictions were imposed on the wharf due to the structural instability of piles to safely carry daily loads. In addition, the restrictions included temporary relocation of vessels that are tied up along the south side of the wharf during those periods when southwest winds of greater than 30 mph.

Because of MacMillan Wharf's importance in sustaining the area's economic vitality the town appropriated funds to provide temporary repairs to arrest the deterioration of the wharf. In addition, the town requested that the Corps' feasibility study be held in abeyance and be resumed at some point in the future when the town arrives at a permanent plan of improvements for the inner harbor and MacMillan Wharf. In January 1988, the town manager of Provincetown notified the Corps of the town's ongoing harbor development program and reaffirmed the town's desire to pursue Federal harbor improvements.



VICINITY MAP

Provincetown Harbor, Massachusetts

Department of the Army
New England Division, Corps of Engineers

PLATE 1

On January 31, 1989, a meeting was held with members of Massachusetts Coastal Zone Management Agency (MCZM) and the Corps to discuss the on going feasibility study. Officials of MCZM stated that the proposed navigational improvements for the harbor would have minimal effects on the local environment, but to be consistent with State policy the dredged material from any improvement should be utilized for beach nourishment. By early 1989, a preliminary plan for harbor improvements was presented to town officials of Provincetown. By letter dated February 28, 1989, the town manager provided support of the initial findings of the feasibility study.

The following are main features of the town's development program:

- Due to court imposed restrictions, the town appropriated $300,000 for temporary repairs of MacMillan Wharf. The temporary work was completed in January 1983.
- In 1983 the town appropriated an additional $200,000 to restore the town wharf and develop new inshore facilities for the Provincetown fishing fleet.
- With the active support of the Massachusetts governor and legislature the town received assistance from the U.S. Economic Development Administration and the Massachusetts Department of Environmental Management and the Office of Coastal Zone Management. The long range harbor improvement program was funded at a cost of $2.8 million.
- In December 1987, the Massachusetts governor and legislature passed legislation which included an additional $6 million to complete harbor improvement facilities. Which would enable the town to serve its commercial fishing fleet and the boating public long into the future.

The renovation and the upgrade of harbor facilities at MacMillian Wharf includes the following:

- Removal of portions of an existing pier and strengthening of other portions.
- Construction of a new approach pier.
- Construction of two pile supported berthing piers and a pile supported platform on which will be constructed a 24,000 square foot (s.f.) building. The building will be used for fishing industries support services.
- Dredging of a turning basin and an anchorage area to -15 ft. MLW and -8 ft. MLW respectively.

By January 1988 the majority of the harbor improvements were completed. It was at that time that the town manager requested the Corps to resume its planning study of navigation improvements in Provincetown Harbor.

As the Corp's study effort progressed, meetings were held with local fishermen, concerned citizens, town officials and the Massachusetts Office of Coastal Zone Management and the Division of Waterways to explain harbor improvement options under investigation. Participants were sent copies of communications the Corps received concerning the study, and were invited to provide their comments and ideas.

Interagency coordination and public involvement helped shaped a plan that would reduce both delays and damages associated with navigating the inner Provincetown Harbor while maintain the town's economic industrial mainstay, namely commercial fishing. The high degree of cooperation helped in reaching related local and state goals by addressing the area's seasonal high unemployment.

The Report and Study Process

The initial steps in this study included a comprehensive inventory of available information, performance of hydrographic surveys, environmental sampling and testing and the preparation of base plans utilizing existing topographic surveys. Extensive efforts were expended in contacting public officials to provide information and seek input to the study process. Based on these efforts, planning objectives and constraints were developed and alternative plans formulated. These plans were developed and evaluated in coordination with state and local authorities. Final conclusions and recommendations were then developed.

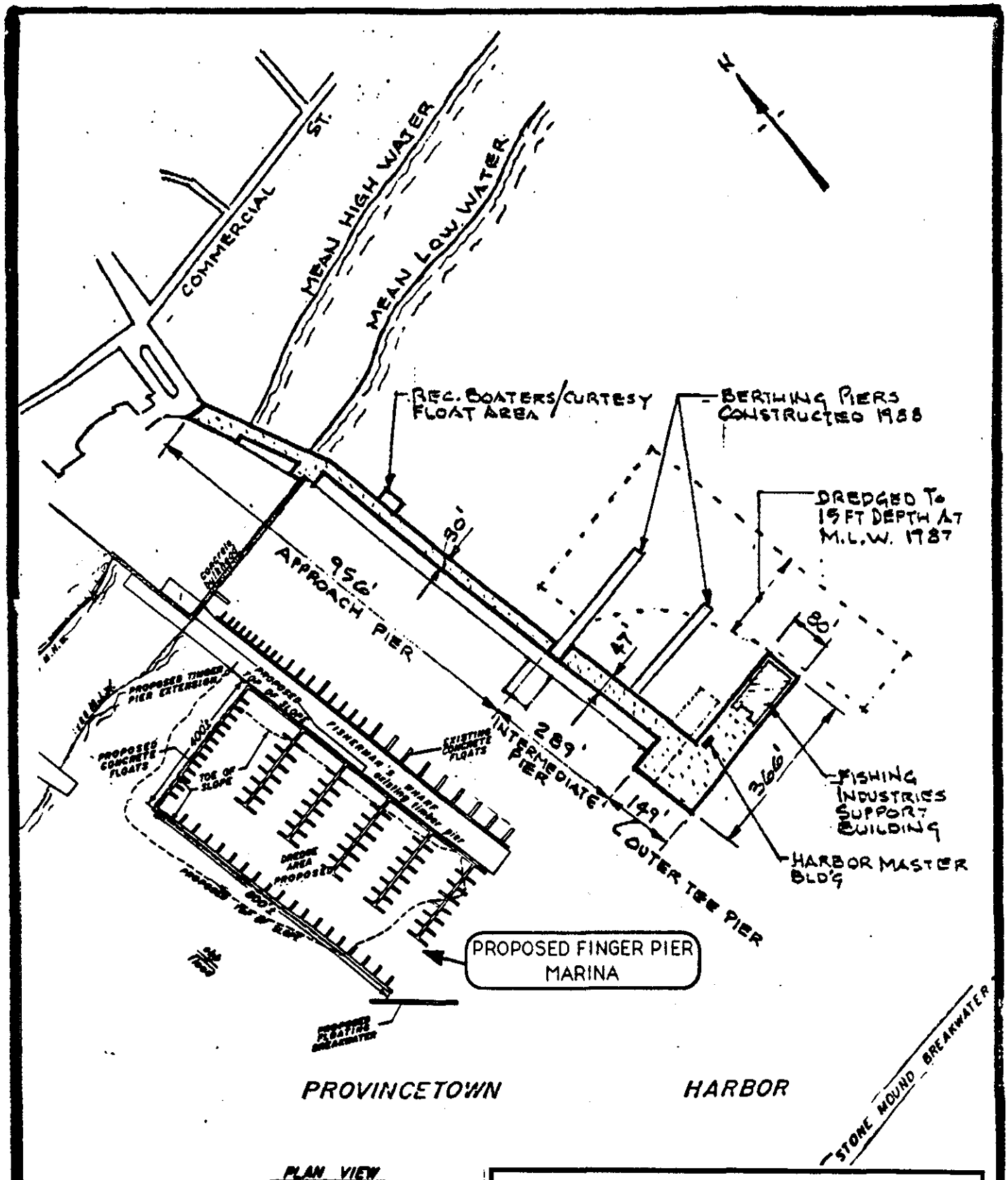
This report consists of a main report and Environmental Assessment, and three appendices. The report summarizes the planning process and presents the findings of various efforts performed to best evaluate the proposed alternative plans of improvement as well as the Division Engineer's recommendation. The Environmental Assessment contains an examination of possible effects to the environment resulting from construction of the proposed project. Appendix 1 is the Engineering Investigation, Design and Cost Estimates, which presents the findings of field investigations including the construction cost estimate for the proposed project. Appendix 2 is the Social and Economic Assessment. This appendix assesses the the annualized benefits to the commercial fishing fleet derived from implementation of the alternative plans of improvement. Appendix 3 contains pertinent correspondence.

Prior Studies and Improvements

Federal: There are two existing Federal projects in Provincetown Harbor. Both were adopted in 1910, modified in 1948 and amended in 1967. One is a rubble stone dike extending about 6,150 ft. from Stevens Point, at the west end of the harbor, to Wood End, and a 300 ft. extension of beach protection at Long Point at the south side of the harbor. The other project is the existing stone mound breakwater in front of the town pier (MacMillan Wharf). The breakwater which is 2,500 ft. long, 15.5 ft. above MLW trending in an east-west direction, was completed in July 1972 (See Plate 1).

Other Development: Aside from the upgraded MacMillian Wharf as previously discussed, the town of Provincetown has also developed and improved its shoreline. The availability of new finger piers, wharves, parking facilities, marinas, boat yards and other businesses offering marine services has kept Provincetown a convenient boating location.

It should be noted that at this time the owners of Fishermen's Wharf, which is along side of the town wharf, are currently seeking permission from the Corps to expand their wharf and construct associated marina facilities in the harbor. The work would include construction of an 800 foot long pier, the placement of 100 floats, a floating breakwater, retention of 70 moorings and the dredging of approximately 41,500 cubic yards (cu. yds.) of sandy material. For the purposes of this study we will assume that the expansion of Fisherman's Wharf will be approved and completed within the next couple of years. The major features and improvements by both Federal and non-Federal interests are shown on Plate 2.



EXISTING & PROPOSED INNER HARBOR IMPROVEMENTS

Provincetown Harbor, Massachusetts

U.S. Army Corps of Engineers
New England Division

PLATE 2

II. PROBLEM IDENTIFICATION

This portion of the report describes the most probable future conditions and related navigation problems for the study area assuming no new Federal navigation improvement project is constructed. Alternatives presented later in this report are assessed and evaluated by comparing them to this "without project" condition.

Existing Conditions

Provincetown is an incorporated municipality in Barnstable County, Massachusetts, located at the northernmost tip of the Cape Cod peninsula in southeastern Massachusetts. It is bordered by the town of Truro to the east, Cape Cod Bay to the south and west, and the Atlantic Ocean to the north. The tidal coastline of Provincetown consists of 21.3 miles, most of which lies within the Cape Cod National Seashore. The total land area within the town is 8.35 square miles. By highway the town is accessible by U.S. Route 6 and is approximately 35 miles from the Cape Cod Canal.

Development/Economy: Provincetown is predominantly a residential community with no heavy industry. The area's population increases considerably during the summer. The town clerk places the winter population at 4,000 and the summer population at 20,000 (1989 estimate).

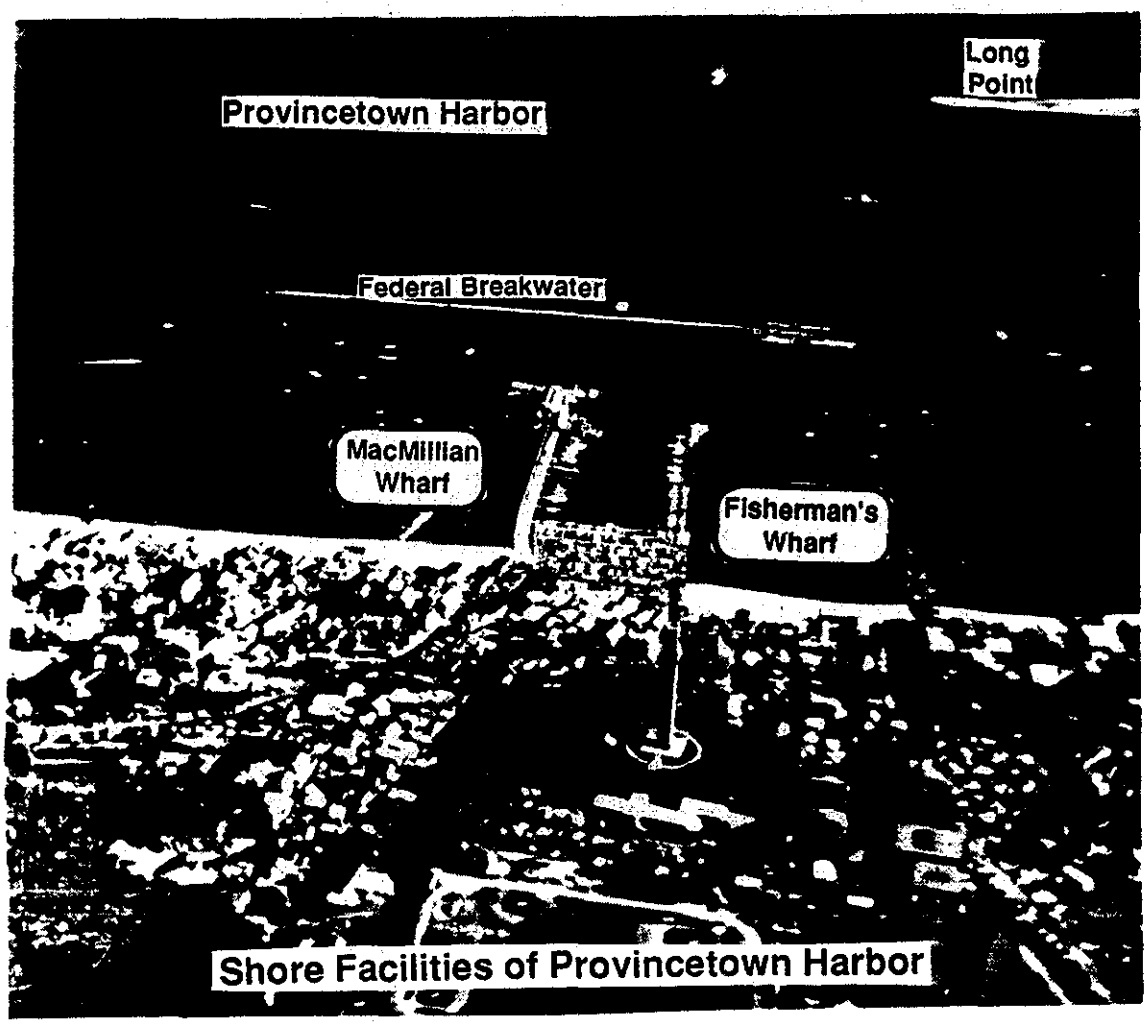
Provincetown is one of the oldest towns in the country. On November 21, 1620 the Pilgrims first dropped anchor in Provincetown and drew up the Mayflower Compact before finally sailing to Plymouth. By 1727 enough settlers had arrived and incorporated Provincetown as a town. During the 1800's Provincetown became one of the busiest seaports in the country. The harbor became home port for about a dozen whaling vessels and a cod fishing fleet. The fishing industry concentrated on supplying the fresh fish needs of Boston and New York. Today Provincetown is home to 428 registered vessels, of which 42 are commercial fishing boats, 10 are partly/tour boats and the remaining 376 are recreational boats. Fisheries in the harbor account for a large amount of the town's revenue. In 1987, approximately 11.7 million pounds of fish (excluding lobsters) were landed.

In the twentieth century tourism and fishing have established themselves as the main elements in the town's economy. The primary source of Provincetown's revenue is the tourist industry. The tourist industry has created an extremely seasonal economy for the town. The town has the highest unemployment rate in the state. Provincetown's physical development reflects its origin as a fishing community.

Currently, Provincetown is both a commercial center and a summer resort, accommodating many tourists as well as seasonal residents. The service industry is the largest source of employment for the township with over 23% of the total work force, while less than 7% of the population is employed in the fisheries industries.

Provincetown Harbor has become one of the busiest historic and commercial centers in the State. The harbor is 3.5 miles long and slightly over a mile wide. Within the harbor there is a municipal wharf "MacMillan Wharf", a private marina "Fishermen's Wharf", a U.S. Coast Guard pier and several old wooden piers which jut into the harbor from the beach. Protecting the harbor is a solid fill Federal breakwater located 500 yards south of the municipal wharf. This breakwater is 2500 ft. long and extends in an east-west direction parallel to the shoreline.

Local interests over the years have built numerous bulkheads, groins and seawalls, along the beach facing Provincetown Harbor to retard the shoreline erosion processes. The U.S. Coast Guard Pier is located approximately 2000 ft. west of the study area and extends 1400 ft. out from the shoreline. Fishermen's Wharf is a 1000 foot long pier located about 400 ft. west of MacMillan Wharf.



Shore Facilities of Provincetown Harbor

Problems, Needs & Opportunities

Present Navigation: Navigation of commercial fishing vessels within Provincetown Harbor has become increasingly restricted in recent years because of the shoaling of the inner harbor along both ends of the Federal Breakwater. The lack of depth in the harbor has resulted in the grounding of fishing vessels while underway and tidal delays. The formerly naturally deep inner harbor has become more shallow due to shoaling, making navigation hazardous and resulting in dragging damages when the larger commercial fishing vessels hulls drag along the harbor bottom.

Along the east end of the breakwater shoaling has become quite extensive. Currently only boats that draw 7 ft. or less attempt navigation along the breakwater's east end. Most boats utilize the west end of the breakwater to enter and exit the harbor. Depths along the west end of the inner harbor range from -10 ft. to -17 ft. MLW. This depth is sufficient for the recreational fleet and for some of the commercial fleet. However, there are eleven large draggers which experience dragging damages to their propellers and rudders. It is estimated that these fishing vessels experience annually grounding or dragging damages of $3,500 per vessel while attempting to navigate the inner harbor. The eleven large fishing boats also incur tidal delays. These fishing boats must wait for high tide to enter or exit the harbor to avoid damage. Based on information provided by the fishermen, the tidal delays occur 4 to 5 times per month and last 1 to 1-1/2 hours per delay.

There is also a problem in the harbor concerning the lack of protection from southwest winds and waves. There is currently a court order restricting the use of the "T" section of MacMillan Wharf when the southwest winds exceed 30 miles per hour (mph) because of the wharf's structural problems. When the winds exceed 30 mph, any commercial fishing boats tied up at the "T" section of the wharf must be moved to the southwestern section of the harbor near Long Point, over one mile away. It has been estimated by the Harbormaster that, on average, it is necessary for eight commercial fishing boats be moved from the wharf eight times per year. The boats must wait near Long Point an average of over 5 hours until the winds and waves subside. The southwest winds and waves also cause problems to the commercial fishing fleet in the form of chaffing and rail damages and off-loading delays. Eight Provincetown draggers with lengths greater than 60 ft. experience annual damages from the southwest winds of $3,000 per boat and seven draggers with lengths less than 60 ft. experience damages of $1,500 per boat

Southwest winds also cause problems to the Provincetown recreational fleet. These problems include boats breaking free of their moorings, chaffing and collision damages and general inconveniences. Three recreational vessels have been identified to incur annual damage costs of $10,000 per vessel from problems caused by the strong winds and waves.

Future Conditions if no Federal Action is Taken

Without Federal involvement in the provision of navigation improvements, the existing conditions and trends, as previously described, will continue in Provincetown Harbor. The area's potential opportunity for growth as a commercial fishery and recreational resources would not be fully realized. Current utilization of the harbor would continue to decline and the commercial fishing fleet would be reduced in size and efficiency and perhaps be eliminated as shoaling further restricts navigation. Groundings and tidal delays in Provincetown's inner harbor will increase as shoaling continues. Increased repair costs, down-time and tidal delays will result in increasing the cost of the commercial fleet doing business at Provincetown Harbor.

Without some harbor improvement plan, both the commercial and recreational fleets in Provincetown Harbor, will continue to be moved causing those vessels to incur fuel and labor time cost during periods of strong southwest winds. Boats will continue to experience damages from banging against the pier during periods of southwest winds, and fishermen will continue to experience off-loading delays and their associated costs when the winds and waves are too strong to off-load safely.

III. PLAN FORMULATION

This section describes the alternatives that were studied, the plans that were developed and the process that was used to screen each plan. The formulation and analysis of alternative plans to reduce and or eliminate navigation problems is based largely on careful review of the existing and future conditions as well as the problems, needs and opportunities of Provincetown Harbor. When increases in shoaling or damaging winds and waves occur, substantial damages will continue to be sustained by Provincetown's commercial fishing and recreation vessels. Potential methods for reducing future delays/damages within the study area to acceptable levels were evaluated, while taking into consideration the strong state and local interests in retaining the natural appeal and character of Provincetown Harbor.

The Federal Objective

The formulation of plans for navigation improvements at Provincetown Harbor is predicated on a standard set of criteria adopted to permit the development and selection of a plan responsive to the navigation problems and needs of the study area. Each alternative is evaluated on the basis of its contribution to the planning objectives. Selection of a specific plan is based on technical, economic and environmental criteria which permits the fair and objective appraisal of the effects and feasibility of alternative solutions.

Technical criteria requires that the optimum plan have the facilities and dimensions necessary to accommodate the expected user vessels with sufficient area to provide for maneuvering of boats and potential development of shore facilities.

The Federal objective of water and related land resources project planning is to contribute to the National Economic Development (NED) consistent with protecting the Nation's environment pursuant to national environmental statutes, applicable executive orders and other Federal planning requirements. Economic justification criteria requires that annual benefits due to the navigation improvements exceed the annualized economic costs of those improvements. The proposed project should reasonably maximize net annual benefits. Corps financial participation is limited to the level of development of the plan which maximizes net benefits. One plan, called the NED Plan, must be formulated, consistent with Federal objectives. Other plans may be formulated which have less net NED benefits in order to further address other Federal, state, local and international concerns not fully addressed by the NED Plan.

Planning Objectives & Constraints

The planning objectives for this study were based on an assessment of the problems, needs and opportunities in the study area, as determined by Corps investigation statements, concerns and goals of the affected region. The degree to which the alternative plans meet these objectives, while complying with required criteria, determines which alternative will ultimately be selected.

The objectives of this study are to:

- Reduce the potential navigation grounding damages in the study area;
- Reduce the potential navigational delays posed to the commercial fishing fleet;
- Preserve the valuable national resources in the inner harbor area - its vegetated shallows, water quality and navigation;
- Provide an optimum navigation system to efficiently serve the needs of the commercial fishing operations and recreational boating interests now using or potentially desiring to use Provincetown Harbor;
- Preserve and enhance recreational opportunities; and
- Support the objectives of other planning agencies and complement regional long range recreational, environmental protection and commercial fishery development plans.

Planning constraints are those parameters that limit the implementation of any proposed plan of improvement and serve to eliminate from consideration those possibilities that offer no acceptable degree of satisfaction. These constraints can include natural conditions, economic factors, social and environmental considerations, and legal restrictions. The following constraints defined the precise nature of the study:

- Current Massachusetts state policy directs that any dredging operation for navigation improvements be utilized as beach nourishment, provided the material is compatible.
- Alternatives considered should not unduly encroach upon planned harbor improvements. Evaluation of alternatives will consider local, state and Federal laws affecting the development within the study area.

All alternative plans, including the NED plan, were formulated in consideration of four criteria: completeness, effectiveness, efficiency and acceptability.

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. Each plan must be complete within itself to provide the benefits claimed for that plan.

Effectiveness is the extent to which the alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency is the extent to which an alternative plan is a cost effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment.

Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public, and compatibility with existing laws, regulations and public policies.

An economic evaluation is based upon the following terms and definitions:

Project First Costs include estimated costs for construction, contingencies, engineering, design, supervision and administration, real estate and mitigation, if any.

Project Investment includes both the Project First Cost and interest during construction on project expenditures until features become operational or begin producing benefits.

Operation, Maintenance and Replacement Costs include all average annual costs estimated for the project after it is constructed to keep it operating and maintained in optimum condition in accordance with provisions prescribed by the Corps. Also included are the average annual costs of major replacements over the project life.

Average Annual Costs include the project investment amortized over a 50 year project life at a Federal interest rate of 8 and 7/8 percent plus the estimated project annual operation, maintenance and replacement costs.

Average Annual Benefits include that portion of the average annual navigation damages prevented by the selected alternatives plus any other related NED benefits;

Benefit-to-Cost Ratio (BCR) is an indicator of the economic feasibility of the plan which is determined by dividing average annual benefits by average annual costs.

Net Annual Benefits is the difference between average annual benefits and average annual costs.

In order to enhance the physical and social environment of the study area and to avoid creating unacceptable project effects, the following environmental considerations were evaluated:

- To avoid wherever possible the direct loss of vegetated shallows;
- To avoid adversely affecting the water quality of the harbor;
- To avoid creating flows in the navigation channel that exceed 3 knots or 5.1 feet per second to assure safe passage for navigation;
- To reduce or mitigate any significant adverse effects which cannot easily be avoided.
- To design and develop project features so as to provide opportunities which enhance the environment and recreation in the study area.

Analysis of Alternatives

This section describes the range of alternative plans considered to improve the existing navigation conditions of Provincetown Harbor. Each alternative was investigated in sufficient detail to determine their economic and engineering feasibility, the effects of implementation and public acceptance. A broad range of management measures can be identified and evaluated as the basis for formulating alternative plans to solve the navigation problems in the harbor. These management measures are categorized as either structural or nonstructural.

Structural measures are identified as those that involve the construction of features that would, to varying degrees, meet the study objectives developed for Provincetown Harbor. These alternatives typically would include the construction of navigation channels and breakwaters in the harbor. Nonstructural measures involve those solutions that would achieve the same objectives, but would do so by means not involving new construction, such as the transfer of vessels to neighboring ports.

Various combinations of structural and non-structural alternatives were evaluated as to their capacity to solve the navigation problems in the inner harbor. Each measure was investigated to determine: economic and engineering feasibility, associated environmental and social effects of implementation and the public attitudes. A number of navigation improvement alternatives were developed and analyzed during the early stages of this study. These alternatives included various dredging options, construction of protective structures and the transfer of the commercial vessels experiencing grounding damages and tidal delays to neighboring ports.

In the reconnaissance study phase four alternative plans were identified for evaluation:

A) No action plan (maintain present conditions in Provincetown Harbor).

B) Provide a navigation entrance channel into Provincetown's inner harbor

C) Provide a solid fill breakwater

D) Transfer of vessels to other nearby ports

A) No Action Plan: Without Federal involvement in providing navigation improvements to Provincetown Harbor, damages sustained by the commercial fishing fleet while navigating the inner harbor and berthing at MacMillan Wharf will continue. Future demand for use of the harbor by both commercial and recreational interests is not expected to increase significantly but will remain strong. This future condition is due to the limited opportunities for new marina developments and/or additional shore facilities to attract more users to Provincetown Harbor. For these reasons a no action response is unacceptable.

B) Navigation Entrance Channel: This plan would provide for a navigation channel which would reduce commercial traffic congestion, tidal delays, grounding damages and add to the overall navigational safety in the inner harbor. Based on a survey conducted by the Corps in 1988 of the commercial fishing vessels currently using the harbor, it appears that there is sufficient economic justification for creating a navigation channel in Provincetown's inner harbor to prevent tidal delays and grounding damages. A portion of the existing fishing fleet in the harbor draws up to 13 ft. when fully loaded. For the purposes of this study a navigation entrance channel is a viable alternative and warrants further study.

C. Provide a Solid Fill Breakwater: This plan would provide for a solid fill breakwater structure. The breakwater would be located west of Fisherman's Wharf. The structure would be aligned in the outer harbor to eliminate the majority of the damage caused by southwesterly waves to both the commercial and recreational fleets tied up at MacMillan and Fishermen's Wharfs. This alternative was found to merit further detailed study.

D. Transfer of Vessels to Other Nearby Ports: This plan consists of relocating a portion of the operations of the commercial fleet to other harbors in the area that may be better suited to the needs of these fishermen. Harbors considered include Scituate, Plymouth, Boston, Chatham, Duxbury and Marshfield. The transfer of the fishing vessels from Provincetown Harbor to nearby harbors is predicated on the ability of these harbors to provide adequate protection, capacity, and efficiency of operation. This alternative was also found to merit further detailed study.

The plan formulation process involves the development and evaluation of those management measures previously described. Alternatives that did not address the problems and opportunities were not considered further. Harbor improvement plans were designed to achieve the national objectives and meet the problem and opportunity statements developed previously. State and local objectives were also considered in the evaluation of alternative plans. Table 1 describes the alternatives selected for further study.

TABLE 1

ALTERNATIVE HARBOR IMPROVEMENTS FOR NAVIGATION
Provincetown, Massachusetts

I. Structural
A. Provide a navigation access channel.
B. Provide a solid fill breakwater

II. Non-Structural
A. Relocation

The three alternative plans selected for further detailed study addressed to varying degrees the problems, needs, and opportunities which exist in Provincetown Harbor. All three plans would benefit both recreational boating and commercial fishing interests. The descriptions of each of the plans are as follows:

I. Structural Alternative A

Provide a navigation access channel: This plan would involve the establishment of a Federal channel in Provincetown Harbor. The channel alignment must be designed for safe navigation to and from Fisherman's and MacMillan Wharfs as well as the town anchorage just east of MacMillan Wharf. This channel would terminate just seaward of the existing breakwater. This plan would ease the existing delays and damages experienced by the fishing fleet when attempting to navigate the inner harbor.

Over the past ten years the harbor depths along the northeast end of the breakwater revealed significant shoaling, while along the southwest end of the breakwater there has been only moderate shoaling. In addition, harbor depths along the southwest end of the breakwater range from -10 ft. to -17 ft. MLW, while along the northeast end harbor depths range from -4 ft. to -10 ft. MLW. The shoaling trends in the harbor indicates that a channel beginning at the town wharf and terminating southwest of the breakwater would be the most economical in terms of its initial construction and future operation and maintenance costs.

Two methods of dredging considered for this project were mechanical and hydraulic dredging. Hydraulic dredging was selected over mechanical dredging for the following reasons:

- Less benthic disruption to the harbor bottom, i.e. turbidity.
- Because of the long haul distance to the open water disposal site, dredging by mechanical means, $12 per cubic yard (c.y.) was found to be very costly compared to hydraulic dredging, $5-6 per c.y.
- The material was analyzed and determined to be completely compatible and suitable for beach nourishment. With the assistance of town officials and residents it was determined that the most logical site for the placement of beach nourishment is just west of Fisherman's Wharf. A maximum beach frontage of 600 linear ft. would be required for the nourishment operation.

Option 1. The Bay State Steamship Company operates a passenger ferry, the Provincetown II, that runs daily between Boston and Provincetown from May to October. To accommodate two-way passage of vessels, the channel was designed to allow concurrent passage of the ferry, with a 90 foot beam, and an average commercial fishing boat with a 20 foot beam. A channel width of 300 ft. was determined to be necessary for safe two-way navigation. The channel would terminate just seaward of the existing breakwater.

Option 2. As with Option 1. this plan would involve dredging an entrance channel. This alternative proposes a channel designed to accommodate two-way traffic under normal circumstances. The channel was designed to allow for the passage of a "Whale Watch" boat with a 60-foot beam along with an average size fishing boat having a 20-foot beam. A channel width of 250 ft. was developed for this alternative. It should be noted that upon entering the 250 ft. width channel the Provincetown II ferry requires approximately 10 minutes to berth at MacMillian Wharf. Upon leaving the wharf the ferry requires the same amount of time to exit the channel. Although this proposed channel is designed for two-way traffic under normal circumstances. When the ferry is present in the channel, vessel traffic will have to be limited to one direction.

To properly evaluate the optimum depth for the proposed channels, depths between -12 ft. and -15 ft. MLW were evaluated. Disposal of the dredged material would also be hydraulically disposed of along the beach to the east of Fisherman's Wharf. Dredging quantities and costs were estimated for both the 300 ft. and 250ft. width channels. Table 2 shows dredging amounts and construction costs for both channel alternatives. For a further discussion of the technical criteria and guidance in the design of the navigation channels, please refer to Appendix 1 - Engineering Investigations/Design and Cost Estimates.

See Plate 3 for both optional channel locations and alignments. It should be noted that the proposed channels in conjunction with the recently completed town berthing area at MacMillan Wharf can provide a sufficient size turning basin for all vessels presently utilizing the harbor.

TABLE 2

CHANNEL ALTERNATIVES
Provincetown Harbor, Massachusetts

CUBIC YARDS OF MATERIAL TO BE REMOVED

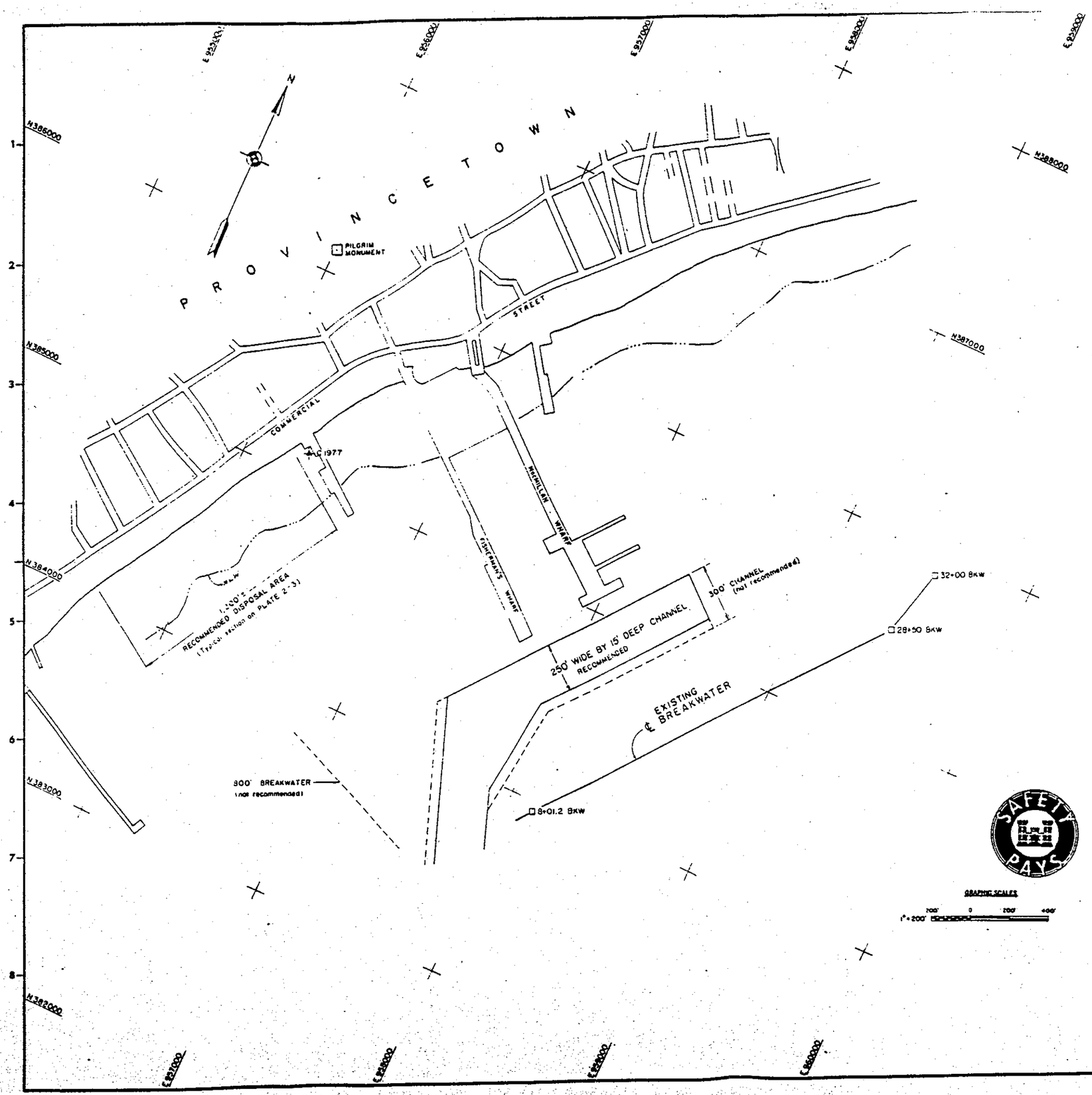
Project Depth below MLW	Option 1 300 ft. width channel	Option 2 250 ft. width channel
12'	11,500	10,000
13'	22,700	19,500
14'	37,300	32,900
15'	56,000	46,200
	ESTIMATED FIRST CONSTRUCTION COSTS (October 1989 price level)	
12'	$262,000	$253,500
13'	$299,500	$282,500
14'	$346,000	$331,500
15'	$400,000	$364,500

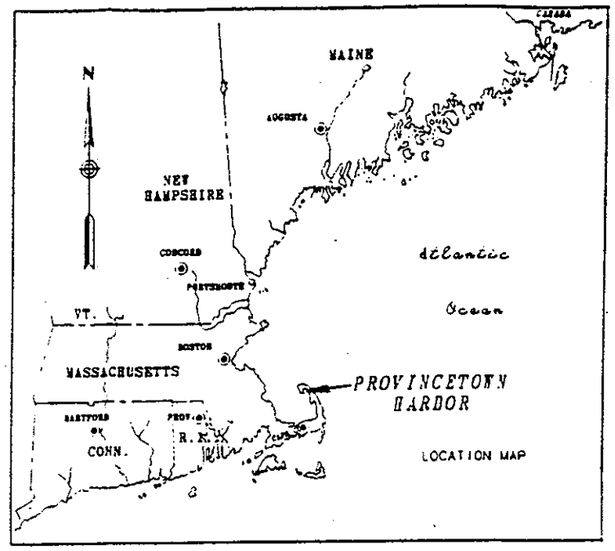
I. Structural Alternative B

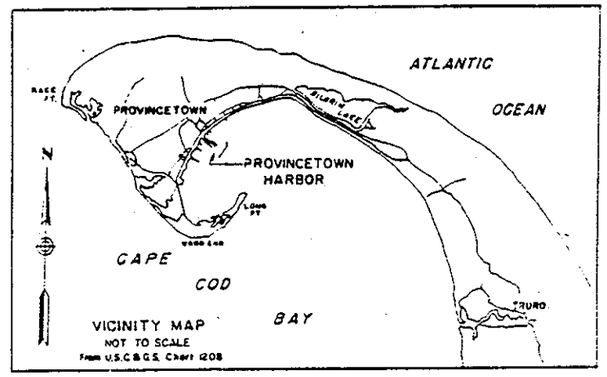
Provide a solid fill breakwater: This alternative would encompass the construction of a solid fill rubble mound breakwater, to reduce the intensity of the southwest winds and waves in the inner harbor. It was determined that an 800 foot breakwater approximately 1000 ft. perpendicular offshore and extending seaward, located between the U.S. Coast Guard Station and Fisherman's Wharf, would be necessary to effectively dissipate the winds and waves. The breakwater alignment is shown on Plate 3. Both fishing and recreational vessels have sustained damages due to wave attack from southwest winds. Waves of up to 6 ft. in height have been observed at both fishing piers. The breakwater was designed to restrict the maximum allowable wave height to 1.5 ft. at both piers. The breakwater was positioned as close to the existing Federal breakwater as possible without causing difficulties to navigation in the inner harbor. A construction cost estimate for the breakwater is $1.95 million which includes contractor overhead & profit, engineering & design, supervision & administration and mobilization & demobilization.

II. Non-Structural Alternative A

Relocation: This solution would entail the transfer of existing deep draft commercial fishing vessels to other nearby ports. Fishing boats that draft over 10 ft. MLW could be selected for this relocation.







NOTES:

Coordinates are based on the Lambert Grid System for the Commonwealth of Massachusetts.

General Notes are on PLATE 2-2

SAFETY PAYS

GRAPHIC SCALES

200' 0 200' 400'

1"=200'

STRUCTURAL ALTERNATIVES HARBOR IMPROVEMENTS

Provincetown Harbor, Massachusetts

U.S. Army Corps of Engineers
New England Division

PLATE 3

Relocation of that portion of the deep draft commercial fleet to other harbors in the area was not considered an acceptable or reasonable alternative for the following reasons: (1) The town has improved facilities at the town pier to maintain and support the economic vitality of Provincetown Harbor for commercial fishing interests. The town feels that the existing commercial fishing fleet based at Provincetown is economically viable and has potential for growth with the support of improved shore facilities at the town pier. Relocation of the commercial fleet to other harbors would not serve the economic interests of the town. (2) Through conversations with officials at other nearby harbors, it was determined that transferring surplus commercial craft to nearby ports is impractical. The same overcrowded conditions which exist at Provincetown also exist in nearby ports due to the substantial increases in commercial and recreational boating over the past twenty years.

Nearby ports experience the same problems of overcrowding as Provincetown. All are further from those areas fished by the Provincetown commercial fishing fleet. These ports lack available safe anchorages to satisfy their own existing demands. Ports such as Plymouth, Scituate, Chatham and Hyannis could not accommodate increased traffic during the summer months when recreational vessels crowd the harbors. Since Provincetown's commercial fishing fleet is mostly composed of draggers, transfer to more distant ports would not be cost-effective. For the above reasons, this alternative was not pursued further.

Detailed Plan Evaluation

Following the initial dredging of the proposed channel(s), shoaling or filling will occur because of settlement of material from the channel's side slopes and from current and tidal action. The propeller wash and waves produced by passing vessels would also tend to disturb the bottom of the channel, resulting in redistribution of bottom sediments. The shoreline of Provincetown Harbor has been relatively stable for over 150 years. The stability of the Provincetown shoreline is the result of the equilibrium developed by the barrier beach that ends at Long Point. As a result of the adjustment of the shoreline to wave energy, the average annual rate of the westward lateral drift nearly equals the average annual rate of eastward lateral drift. Sand moves along the beach towards the east in the summer due to the prevailing southwesterly waves, and then moves towards the west in the winter, in response to easterly storms. Estimates of dredging costs for all channel alternatives are based on current price levels, assuming beach nourishment disposal of the dredged material.

Historical shoreline changes are primarily the result of *(1)* the direct placement of dredged material on the beach and *(2)* alteration of wave induced erosion caused by the construction of seawalls along the shore and the Federal breakwater offshore. From historical data of maintenance dredging operations throughout the harbor, it is projected that depositions of sediment within the proposed channel is estimated not to exceed an annual rate of 2 percent of the total volume of material to be removed during initial construction. For all of the channel alternatives analyzed, maintenance dredging to maintain project depth and efficiency is only expected to be required every 15 to 20 years.

It was determined that the 250 ft. width channel alternative would be able to handle two-way vessel traffic over 98 percent of the time. Navigation benefits attributed to both the 250 ft. and 300 ft. width channel alternatives would be approximately equal. Therefore, the additional cost of dredging the 300 ft. width channel would not be justified. The 300 ft. width channel alternative was eliminated from further study.

Estimate of Benefits

Benefits attributable to establishing a Federal channel in Provincetown Harbor include labor time and fuel savings by eliminating tidal delays, and prevention of groundings and dragging damages. Benefits to each channel depth examined accrue to the commercial fishing fleet in relation to the boat depths in combination with the affects of squat, pitch and roll and adding to it an underkeel clearance of 0.5 ft. provides alternative channel depths. Commercial fishing boats with loaded drafts of up to 10 ft. would experience full navigational benefits with a 12 ft. deep channel. Fishing boats, with drafts of 11 ft., would experience full benefits with the 13 ft. deep channel. The largest draft fishing boats, up to 13 ft., would receive full benefits with the 15 ft. deep channel. Table 4, Annual Channel Benefits in the Economic Analysis provides a detailed breakdown of the percentage of accrued benefits for each of the dredging depths. The total benefits accrued by the different depths of the channel are derived by combining the annual delays and damages experienced by the commercial fishing fleet. Table 3 details the annual costs of delays and damages experience by the fishing fleet. Recreational craft are not expected to benefit from a deeper channel.

TABLE 3

ANNUAL CHANNEL BENEFITS
COMMERCIAL FISHING VESSELS
Provincetown, Massachusetts

COMMERCIAL FISHING FLEET DRAFTS (ft.)	ANNUAL CHANNEL BENEFITS AT VARIOUS DEPTHS BELOW MLW			
	12'	*13'*	*14'*	*15'*
up *to* 10	$20,000	$20,000	$20,000	$20,000
10 *to* 11	7,000	14,000	14,000	14,000
11 *to* 13	400	1,000	5,000	8,000
TOTAL ANNUAL BENEFITS	**$27,000**	**$35,000**	**$39,000**	**$42,000**

Benefits attributable to the construction of a breakwater include the prevention of damages caused by southwest winds and waves to commercial and recreational vessels, labor time and fuel savings by eliminating off-loading delays caused by the southwest winds. Table 4 illustrates the amount of annual benefits attributable to breakwater alternative.

TABLE 4

ANNUAL BREAKWATER BENEFITS

Provincetown Harbor, Massachusetts

• Prevention of damages & delays caused by southwest winds to the commercial fleet	$34,500
• Prevention of damages caused by southwest winds to the recreational fleet.	30,000
• Eliminate off loading delays caused by southwest winds to the commercial fleet	18,000
• Fuel cost savings by eliminating off loading delays	2,600
• Labor cost savings by eliminating the moving of vessels from the town wharf during high southwest winds	14,500
• Fuel cost savings by eliminating the moving of the vessels	200
Total Annual Breakwater Benefits	**$99,800**

Costs of Alternatives

The first cost of implementing all of the harbor improvement alternatives includes contingencies, engineering and design, and supervision and administration. Costs and interest rates were updated to 1989 levels. The Federal interest rate used in this analysis was 8 and 7/8 percent. Table 5 describes the first cost and total annual costs, including annual operation & maintenance (O&M) costs, for each alternative.

TABLE 5

IMPROVEMENT ALTERNATIVES FIRST & ANNUAL COSTS

Provincetown Harbor, Massachusetts

($000)

	ALTERNATIVE	FIRST COST	AMORTIZED FIRST COST	ANNUAL O & M	TOTAL ANNUAL COSTS
A.	12' MLW, channel	$254	$23	$3.5	$26.5
B.	13' MLW, channel	$283	$25	$5.5	$30.5
C.	14' MLW, channel	$332	$30	$9.0	$39.0
D.	15' MLW, channel	$365	$33	$12.0	$45.0
E.	800' Stone Mound Breakwater	$1,950	$176	$5.0	$181.0

IV SELECTED PLAN

When comparing the annual costs with the annual benefits occurring for each alternative, it was found that the 13 ft. MLW channel was the alternative that produced the highest annual net benefits. Table 6 shows the economic evaluation of all the harbor improvement alternatives.

TABLE 6

ECONOMIC EVALUATION
Provincetown Harbor, Massachusetts
($000)

ALTERNATIVE	ANNUAL BENEFITS	ANNUAL COSTS	BENEFIT/ COST RATIO	NET BENEFITS
A. 12' MLW Channel	$27.3	$26.5	1.0	$0.8
B. 13' MLW Channel	$34.8	$30.5	1.1	$4.3
C. 14' MLW Channel	$38.7	$39.0	0.99	-$0.3
D. 15' MLW Channel	$41.5	$45.0	0.9	-$3.5
E. Stone Breakwater	$99.8	$181.0	0.6	-$81.2

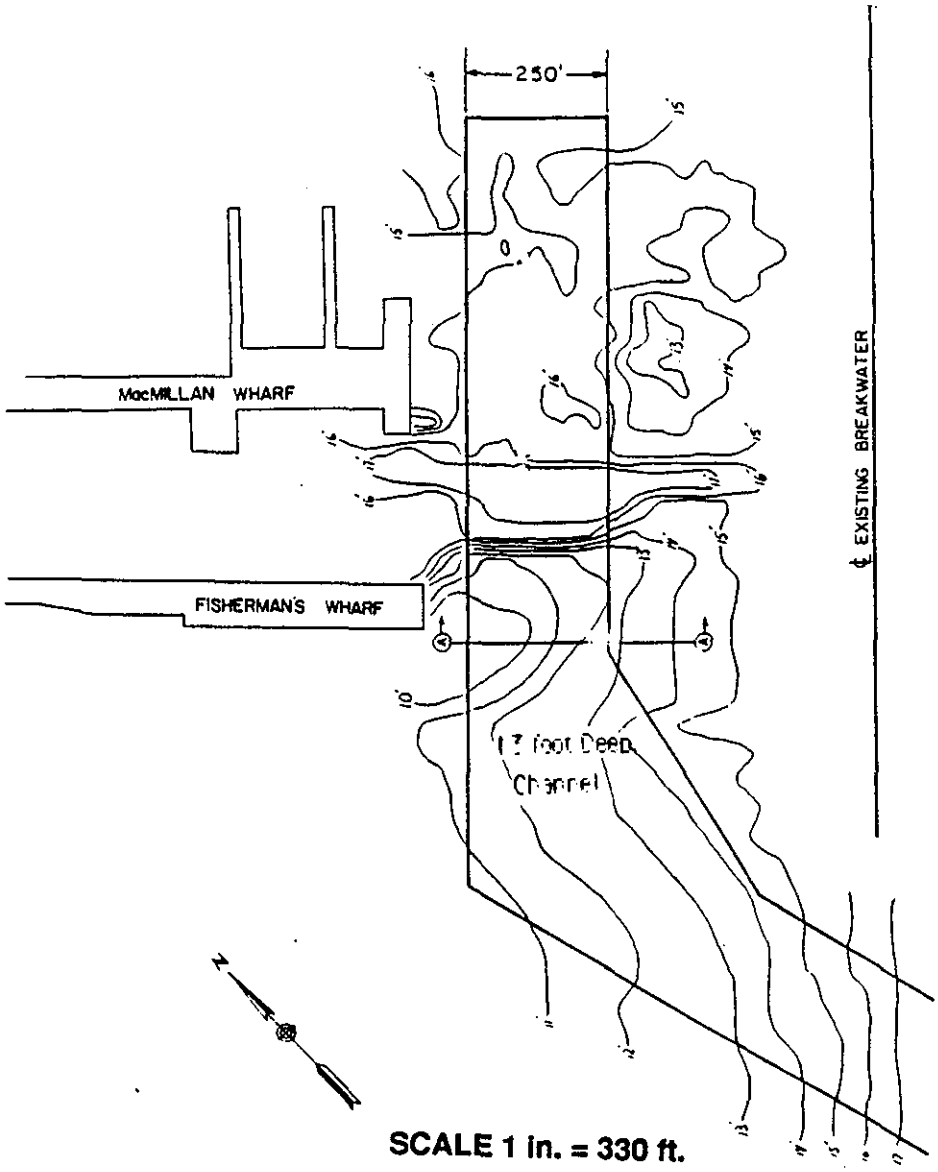
The selected plan for navigation improvement at Provincetown Harbor has been developed on consideration of economic efficiency, environmental acceptability, navigational safety and the problem, needs and objectives of local and state governments. Based on these parameters, Plan B results in the greatest net benefits and provides the most favorable plan for meeting the commercial fishing fleet. The 13 ft. MLW navigation channel has been identified as the National Economic Development (NED) plan and has been determined to not create significant negative environmental, cultural/historical, or social effects to the region. Because a 13 ft. channel depth below MLW is the optimal design, costs were broken down and are shown in Table 7.

TABLE 7

SELECTED PLAN OF IMPROVEMENT
Provincetown Harbor, Massachusetts

Dredging of a 250 ft. wide access channel to a depth of 13 ft. below MLW

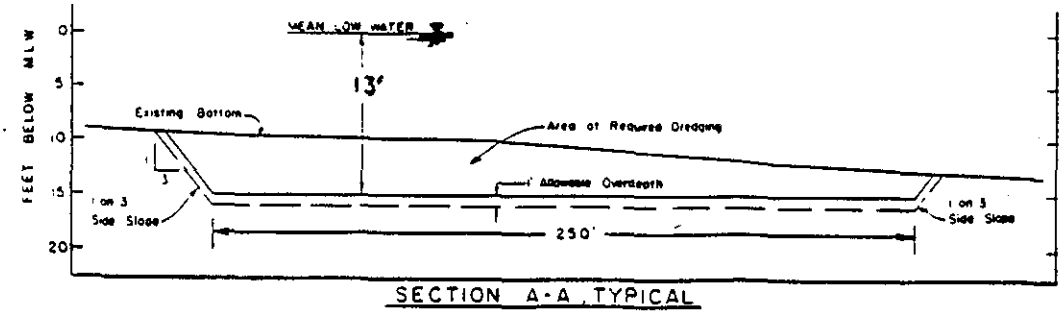
Hydraulic Dredge Ordinary Material 19,500 cy @ $9.50 cy =	$185,000
Contingencies 20%	37,000
Construction Cost	**$222,000**
Engineering & Design	24,000
Supervision & Administration	36,000
Total First Cost	**$282,000**



SCALE 1 in. = 330 ft.

SELECTED PLAN

13 foot Deep by 250 foot Wide Navigation Channel



SECTION A-A, TYPICAL

GENERAL NOTES:

Contours are in one foot intervals and are referred to the plane of Mean Low Water (M.L.W.).

Hydrography from survey of Oct. 1988.

"The information depicted on this map represents the results of surveys made on the dates indicated, and can only be considered as indicating the general conditions existing at that time."

Fieldbooks: R&B 3906 and R&B 3887

SELECTED PLAN
NAVIGATION CHANNEL

Provincetown Harbor, Massachusetts

U.S. Army Corps of Engineers
New England Division

PLATE 4

As shown in Plate 4, the selected plan will provide an access channel 2,000 ft. long, 250 ft. wide by 13 ft. deep at MLW located to the west and just south of the Federal breakwater and terminating approximately 320 ft. east of MacMillan Wharf. It is estimated that three steel can buoys will be necessary for boat safety, at an initial cost of $4,000 per buoy. The sandy material to be removed from the proposed channel would be hydraulically dredged and pumped onto the adjacent beach to the west of Fisherman's Wharf for disposal. The selected plan is estimated to require maintenance at least twice during the project's life time. The channel is anticipated to shoal in at a rate of 390 cu. yds. per year. This shoaling rate has been used in determining the selected plan's annual cost. Construction of the selected plan of improvement should require approximately three weeks to complete and will be undertaken between mid October to end of March time frame.

The first cost of construction of the selected plan of improvement is $282, 000. For the purposes of the benefit to cost analysis, the annual charges and charges for the placement of required aids to navigation and the channel's maintenance dredging amount to $5,500. The total project cost is $288,000.

V ENVIRONMENTAL CONSIDERATIONS

No significant environmental effects are expected to occur during or after construction of the navigation channel. Dredging operations can cause both short term and temporary effects on the environment. The hydraulic dredge will produce minimal amounts of turbidity in the inner harbor. The small percentage of dredged material, that becomes suspended in the water column would rapidly settle out due to the sandy nature of the material. Therefore, any turbidity effects associated with dredging would be minor and cease with completion of the dredging activity. Based on historical shoaling rates, maintenance dredging to sustain the project depth is expected to be required every 15 to 20 years. The hydraulic dredging of 19,500 cu. yds. of substrate from the proposed channel would destroy the benthic community and associated organisms by physical removal. However, because there is a potential impact to winter flounder spawning areas in Provincetown Harbor, dredging and disposal activities will be limited to the September 1 through January 31 time frame. The recolonization of organisms to pre-dredge levels would generally occur within a few seasons.

The use of a hydraulic dredge would cause localized turbidity during the release of the dredged material at the disposal site. The hydraulic pipeline would release slurry onto the beach and into the near shore waters. Some material may be carried away from the disposal site. However, due to the sandy nature of the substrate minimal amounts of turbidity would be expected. Turbidity would cease with the completion of the operation.

The dredged material would be deposited on the beach. Approximately 600 ft. of beach would be needed to dispose of the dredged material. Bulldozers would configure the material to form a 50 foot berm with a 1:15 slope. No material would be placed below MLW. Once the material has been placed on the beach, it would be subject to tides and littoral currents. Since the predominant direction of littoral drift is to the west, the material should not cause significant shoaling of the navigation channel. Although the predominant direction of littoral drift is to the southwest, the total amount of material moved is small. No more than one to three percent of the dredged material placed on the beach is expected to be moved from the site per year. The addition of sand to the beach is not expected to cause significant shoaling in other areas of the harbor.

Coordination with relevant State and Federal agencies indicated that no significant effects on fish and wildlife habitat is expected due to the project's construction. For a more detailed discussion of the environmental effects of the recommended project, see the attached "Environmental Assessment".

VI IMPLEMENTATION RESPONSIBILITIES

The Commonwealth of Massachusetts is the non-Federal sponsor for the project. However, reciprocal agreements with the town of Provincetown will allow the town to provide a portion of the non-Federal cost share. By letter dated February 28, 1989, the town has indicated support for the proposed project.

Federal Responsibilities: Federal responsibility includes its share of construction and 100 percent of future maintenance of the designated Federal channel.

Non-Federal Responsibilities: In accordance with the provisions of the Water Resources Development of 1986, the following is a list of items of local cooperation required for project authorized under Section 107. The local sponsor must provide assurance that they intend to meet these items prior to project authorization.

- Assume full responsibility for all non-Federal costs associated with the project. Current statutes require that the non-Federal sponsor provide at least 20% of the first cost of construction.
- Provide, without cost to the United States, all necessary lands, easements and rights of way and acceptable disposal area necessary for project construction and subsequent maintenance.
- Hold and save the United States free from damages that may result from construction and maintenance of the project.

Cost Apportionment

All of the requirements of the Water Resources Development Act of 1986, including those regarding cost-sharing have been reflected in this report.

The sole purpose of the proposed project is to reduce damages and delays of the commercial fishing fleet based in Provincetown and all costs are allocated as such. Local interests must satisfy the non-Federal cost sharing requirement of 20% of the total first cost of the project. The non-Federal share includes all lands, easements, rights-of-way necessary for the construction of the project; a minimum cash contribution of 10% of the total first cost; and other cash required to meet the 20% cost sharing requirement. Table 8 presents a summary of project investment (reflecting consideration of the current Federal interest rate of 8 and 7/8 percent).

TABLE 8

PROJECT COST SHARING, SELECTED PLAN

Provincetown Harbor, Massachusetts

Federal *(80 percent)*	$225,600
Non-Federal *(20 percent)*	56,400
TOTAL FIRST COST	**$282,000**
Aids to Navigation *(Federal Cost)*	12,000
TOTAL PROJECT COST	**$294,000**

In addition, local interests would be responsible for all costs in excess of the Federal participation cost limit of $4.5 million, if necessary, which would include maintenance and study expenses.

VII CONCLUSION

The New England Division, Corps of Engineers, has received and evaluated the varied views of interested agencies and concerned public regarding the alternative plans. The possible consequences of each alternative have been formulated on the basis of engineering feasibility, environmental effects and economic efficiency. The present conditions in Provincetown Harbor do not meet the demands of reliable and safe access to the public docking facilities at MacMillan Wharf.

This report describes the plan formulation process which develops and evaluates possible harbor improvement alternatives. Each alternative has been assessed in terms of its effectiveness, efficiency, completeness and acceptability to the public.

The town of Provincetown has completed extensive renovations to the harbor. MacMillan Wharf, which is the town's primary commercial pier, has since been renovated and upgraded to include finger piers and the inner harbor has been dredged for additional moorings. By completing these renovations the town significantly reduced one of their primary problems, mooring damages. The town has relocated the commercial fleet so that the prevailing damaging waves from the southwest are not perpendicular but rather parallel to the docked vessels. Although there are residual damages caused by the southwest winds and waves, it was determined that the construction of a breakwater to further reduce those damages would not be economically justified.

Due to these harbor improvements one of the most urgent problems in the harbor is grounding damages and tidal delays experienced by the commercial fishing fleet. During the course of this study it was determined that the designation and construction of a Federal channel at 13 ft. below MLW to eliminate the existing grounding damages and tidal delays was the NED plan and the best solution.

The first cost of the Federal channel is estimated at $282,000. The dredged material, mostly sand, will be hydraulically dredged and placed on the beaches to the south, between Fisherman's Wharf and the U.S. Coast Guard pier. The Benefit-Cost-Ratio (BCR) for this project was estimated at 1.1. Local interests would be responsible for a share in project cost based on 20 percent of the project's first cost. The remaining 80 percent would be borne by the Federal Government.

Maintenance of the project would be expected every 15 to 20 years and would be a Federal responsibility contingent upon the availability of maintenance funds, the continuing justification of the project and the environmental acceptability of required maintenance activities.

We find substantial benefits are to be derived by providing the commercial fishermen with reliable and safe access in Provincetown Harbor. An Environmental Assessment has been prepared as part of this study. Although the proposed improvement would cause a minor disruption to the environment during dredging and disposal operations, these are not considered significant. Due to the substantial benefits attributable to the commercial fishing operators, short term negative effects are considered to be offset by the improvement and the resulting economic efficiencies realized.

VIII RECOMMENDATIONS

I recommend that the 250 ft. wide channel plan selected herein as Plan B to reduce tidal delays and navigating hazards within the inner Provincetown Harbor, Massachusetts, be authorized for implementation as a Federal Project, with modifications under the discretion and advisability of the Chief of Engineers. Presently, the United States project's cost share for the channel plan is estimated at $225,600; and annual maintenance and operation costs is estimated at $5,500. I further request that the New England Division Engineer be designated the approval authority for the construction plans and specifications.

I have considered all significant aspects in the overall public interests including environmental, social and economic effects, and engineering and financial feasibility in concluding that the selected plan is the best implementable alternative meeting the objectives of this investigation.

The recommendations contained herein reflect information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of the continuing authorities Civil Works construction program, nor the perspective of higher review levels within the Executive Branch.

Date 16 Apr 90

Daniel M. Wilson
Colonel, Corps of Engineers
Division Engineer

IX ACKNOWLEDGEMENTS

The New England Division (NED), U.S. Army Corps of Engineers prepared this report under the overall direction of Colonial Daniel M. Wilson, Division Engineer and Joseph L. Ignazio, Chief of the Planning Division. The Plan Formulation Branch (PFB) of the Planning Division has overall responsibility for the study under the supervision of its Chief, Nicholas E. Avtges. Study Management is provided by the Project Formulation Section (PFS) headed by F. William Swaine.

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Study Team:

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Dennis Waskiewicz - Design Schedule
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This report was prepared for publication by:

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Thanks are extended to Provincetown's William A. McNulty, Town Manager, Michelle Jarusiewicz, Ass't. Town Manager and Robert W. White, Harbormaster, who all helped significantly with the study's public involvement program and study coordination.

The following consulting individuals and firms provided extensive and valuable information and analysis during the investigation:

Fay, Spofford & Thorndike, Incorporated, Harbor Development Program, Preliminary Design Report.

Center for Coastal Studies, Charles Westcott, Environmental Benthic Data.

ENVIRONMENTAL ASSESSMENT
404 (b)(1) EVALUATION
and
FINDING OF NO SIGNIFICANT IMPACT

Section 107
Navigation Improvement Study

PROVINCETOWN HARBOR
PROVINCETOWN, MASSACHUSETTS

by
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U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
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March 1990

TABLE OF CONTENTS

I. Environmental Assessment

A. Introduction

1. Purpose

A navigation improvement project is proposed for Provincetown Harbor, Massachusetts. Sand shoaling of the inner harbor area from the town pier, "MacMillan Wharf", to deep water just outside the Federal breakwater has caused tidal delays, and some grounding and dragging damages for deep draft (>10 feet) commercial fishing boats attempting to enter or leave the town pier area. Much of the shoaling occurs at the west end of the Federal breakwater. The currently proposed plan would provide for the establishment of a Federal navigation channel from just outside the Federal breakwater in Provincetown Harbor to the town pier. This improvement would insure safe and efficient access for commercial fishing boats traveling to and from deep water and the protected shore facilities in Provincetown Harbor.

Provincetown Harbor is located in Provincetown, Massachusetts. Provincetown is situated at the northernmost tip of Cape Cod (see Figure 1). Cape Cod Bay is located to the south and east of Provincetown. The Atlantic Ocean is located to the north and west of Provincetown. Provincetown Harbor is 3.5 miles long and slightly over a mile wide. Within the harbor there is a town wharf (MacMillan Wharf), a private marina, a U.S. Coast Guard pier, and several old wooden piers which jut into the harbor from the beach. Protecting the harbor is a rubblemound breakwater located 750 feet southeast of the town pier. This 2,500 foot long Federal breakwater extends in a northeast-southwest direction.

2. Need

Shoaling of Provincetown's inner harbor area has adversely affected the commercial fishing fleet in the following manner. Tidal delays experienced by these vessels have resulted in grounding damages to vessels with drafts greater than 10 feet. Tidal delays have also resulted in increased labor time and fuel costs. The establishment of a Federal channel from the town pier to deep water outside the breakwater would reduce or eliminate these delays and damages.

3. Authority

In a letter dated 6 December 1978, the Provincetown Planning Board requested the Army Corps of Engineers to study alternatives which would increase the safety and protection of the commercial fishing fleet. The authority for this study is granted under Section 107 of the 1960 River and Harbor Act, as amended.

4. Prior Federal Improvements

There are two existing Federal projects in Provincetown Harbor. Both were adopted in 1910, modified in 1948, and amended in 1967. One is a

dike along Provincetown Beach (Cape Cod National Seashore), and the other is the existing breakwater in front of MacMillan Wharf. The breakwater is 2,500 feet long, 15.5 feet high and runs in a northeast-southwest direction.

B. Proposed Project Description

1. Dredging

To reduce damages caused from shoaling, a 13-foot deep mean low water (MLW) and 250 foot wide navigation channel is proposed for Provincetown Harbor (see Figure 2). This 2,500 foot long channel would extend from deep water just outside the west end of the existing Federal breakwater to the town pier. Approximately 19,500 cubic yards of sandy material would be hydraulically dredged from the channel. Dredging would occur sometime between September and the end of January. It is expected to take approximately two weeks to complete the proposed project. Since most of the shoaling occurs at the west end of breakwater, the majority of the dredging would occur in this area.

2. Disposal

Dredged material would be disposed of on the beach located to the west of the town pier (see Figure 2). A hydraulic pipeline would dispose of the material in a slurry consisting of 80% water and 20% material. A section of beach approximately 600 feet long would be required for disposal of the dredged material. The dredged material would meet high ground at about elevation 13.0 feet and be configured to form a 50 foot wide beach berm with a 1:15 slope. No material would be deposited below MLW.

C. Alternatives

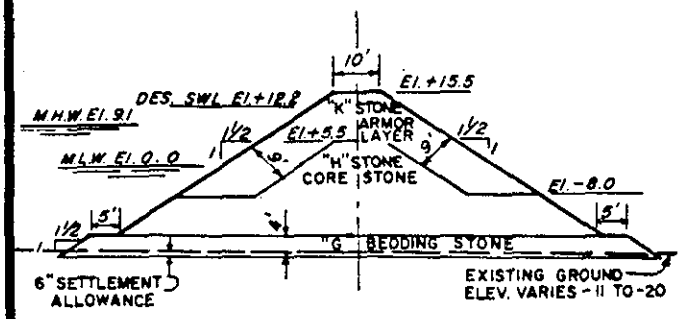
1. No Action

Commercial fishing vessels which use the harbor experience tidal delays, grounding and dragging damages. These impacts are the result of shoaling in the inner harbor behind the breakwater. These conditions are expected to continue or worsen without navigation improvements.

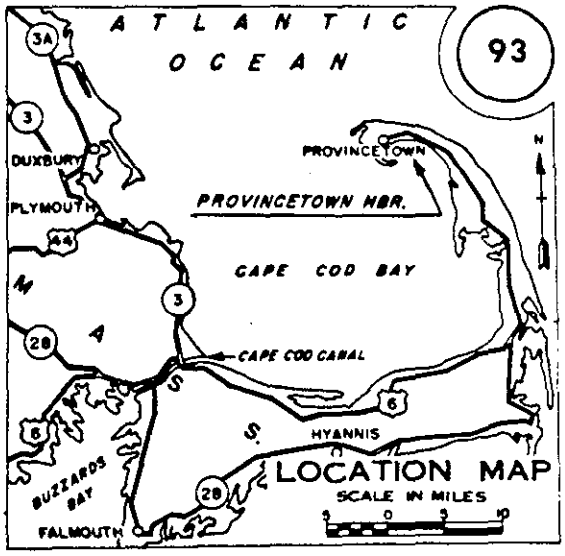
2. Modifications of Proposed Channel Alignment

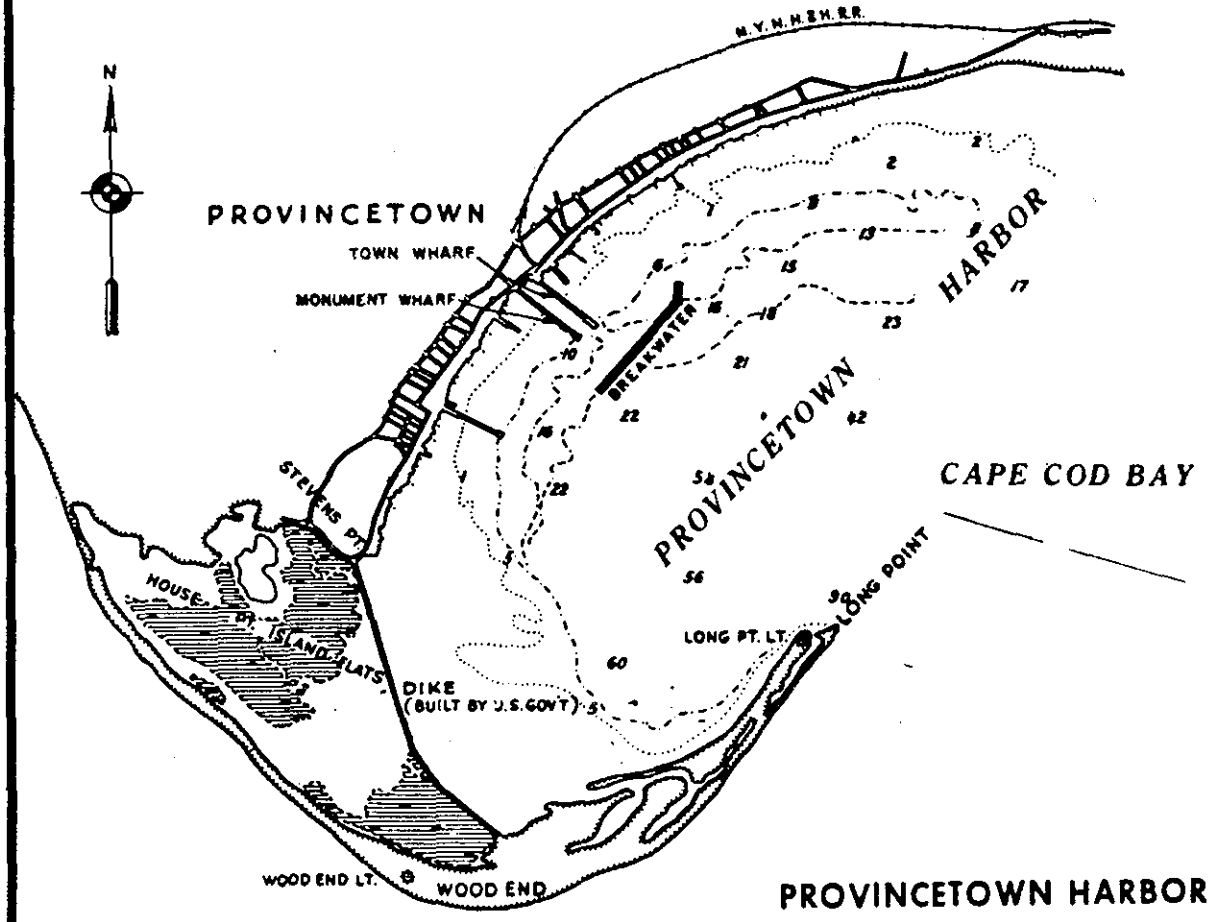
Two alternatives were considered for the proposed navigation channel. Alternative A included a 250 foot wide access channel at 12, 13, 14, and 15 feet deep MLW. Alternative B included a 300 foot wide access channel at the same depths as Alternative A. Alternative A would accommodate two-way traffic under normal circumstances. However traffic would be limited to one direction when the channel is used by the Provincetown II ferry. Alternative B would accommodate two-way traffic at all times.

The variety of vessels which use the harbor and their associated channel depth requirements initiated an analysis of channel depths of 12, 13, 14, and 15 feet below MLW. Most of the commercial fishing vessels



BREAKWATER
TYPICAL SECTION
SCALE IN FEET
10 5 0 10 20 30 40





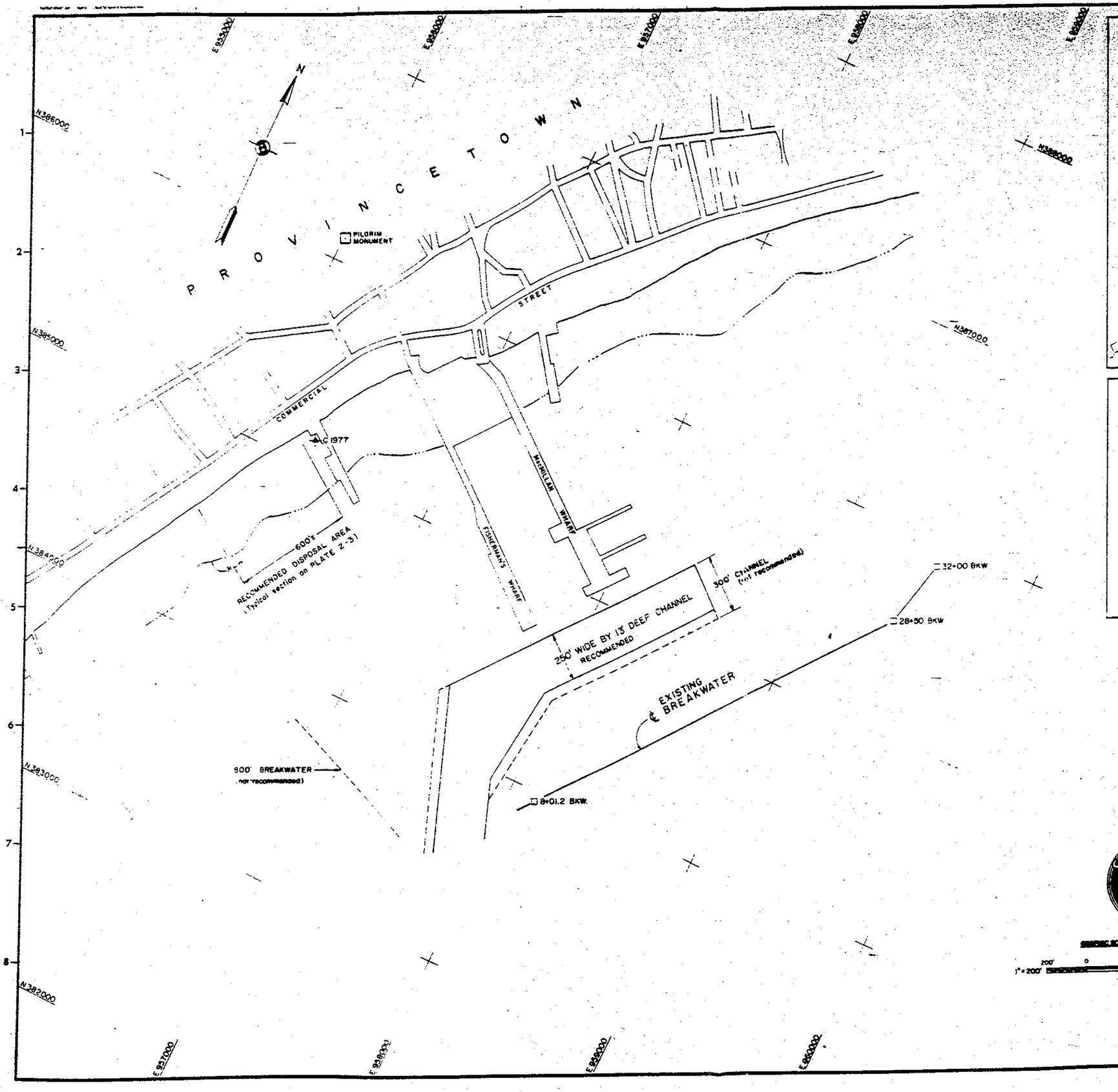
PROVINCETOWN HARBOR MASSACHUSETTS

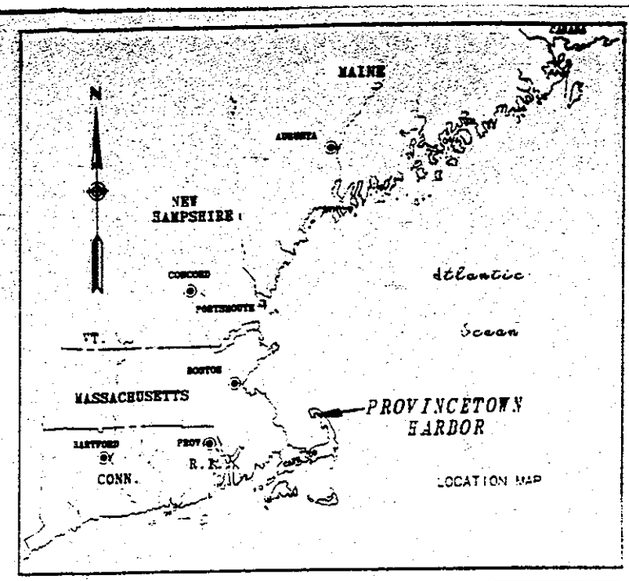
30 SEPTEMBER 1976

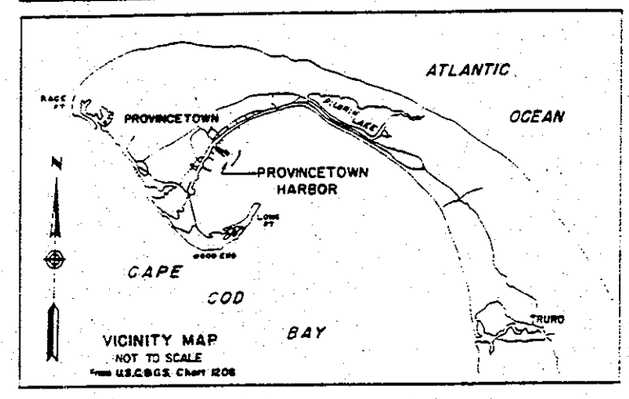
IN 1 SHEET
1000 0 1000 2000 3000 4000 FT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

FIGURE 1







NOTES:

Coordinates are based on the Lambert Grid System for the Commonwealth of Massachusetts.

General Notes are on PLATE 2-2.

SAFETY PAYS

GRAPHIC SCALE
200' 0 200' 400'
1"=200'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

PROVINCETOWN HARBOR, MASS.
NAVIGATION IMPROVEMENT STUDY
GENERAL PLAN

APPROVED DATE

SCALE 1"=200' SPEC. NO. DACW 33

MAP 1

currently using the harbor require 10 to 12 feet of water to operate safely while fully loaded. A few vessels have drafts of up to 13.5 feet when loaded. Additional clearance is required for pitch, roll, and squat, resulting in analysis of the above depths. From the above combinations of alternatives it was determined that a 250 foot wide channel at 13 feet below MLW would be the most economical as well as environmentally acceptable alternative.

3. Modifications of Proposed Dredge and Disposal Alternative

Two dredge methods were considered for this project. The first method involves the use of a mechanical dredge and scow. This method would transport the dredged material to the Foul Area Disposal Site, 37 miles away in Massachusetts Bay. Transporting dredged material that many miles to the Foul Area was found to be very costly compared to other alternatives examined. Also, the disposal of clean sandy material in deep water and out of the littoral system would not be in the best public interest. These factors exclude the use of a mechanical dredge from further study.

The second method evaluated is the use of a hydraulic dredge to pump the dredged material to a nearby beach. The placement of dredged material on the beach would provide additional recreational area and protection against erosion and flooding. The availability of a nearby disposal area makes hydraulic dredging a very cost effective method.

Two potential beach disposal sites were analyzed for this project. One is located approximately 1.3 miles to the east of the project site and would require the use of a booster pump. The increased costs associated with a booster pump and lack of significant economic or environmental benefits associated with this disposal site resulted in dropping this site from further consideration. The other beach site is located approximately 2,000 feet from the dredge zone. A maximum length of 600 feet of beach would be required to dispose of all the dredged material. Historical data has shown the annual net direction of sediment transport in this area to be westward, away from the project site. As a result, this is considered to be the optimum disposal site for all dredging alternatives.

D. Affected Environment

1. Dredge Site

a. Physical and Chemical Environment

The outer arm of Cape Cod is a great sand spit known as a "recurved spit" or "hook" (Mello, 1985). The Provinceland Hook has been formed over the last 6,000 years by the net northward and westward transport of sand by littoral drift. Sand is moved along the northern portion of the eastward-facing outer coast of Cape Cod. The sea cliffs of Truro and Wellfleet provide the glacial material for the "hook". Wave action, especially storm waves, provide the means of littoral transport.

The shoreline of Provincetown Harbor has been relatively stable for the greater part of the past 150 years (Mello, 1985). The stability of the Provincetown Harbor shoreline is the result of the equilibrium developed by the barrier beach that ends at Long Point. As a result of the adjustment of the shoreline to wave energy, the average annual rate of westward littoral drifting nearly equals the average annual rate of eastward littoral drifting, although some net movement of sand occurs to the west. Sand moves along the beach towards the east in the summer due to the prevailing southwesterly waves, and then moves towards the west in the winter in response to easterly storms. The apparent lack of significant buildup of material in either direction of the short groins that jut from the harbor shoreline supports this observation.

The tides at Provincetown Harbor are semi-diurnal with a mean range of 9.1 feet and a mean spring range of 10.6 feet. Tide currents inside Long Point seldom exceed 0.1 knots (Mello, 1985). Tidal currents are even weaker near shore and therefore have very little affect on sediment transport (Mello, 1985).

Salinity in Provincetown Harbor is generally lower in the summer than in the winter (Mello, 1985). The salinity range is between 29 and 33 parts per thousand (ppt). The high salinity range is due to the minimal amount of freshwater input to the harbor. The only sources of freshwater into Provincetown Harbor are precipitation and groundwater runoff (Mello, 1985). The surface water temperature ranged from a high of 22 C. in early August to a low of 0 C. in early to mid-February, based on ten day averages over an eight-year span (1977-1984) (Mello, 1985).

Three surface grab samples and one core sample (to -15 feet) were taken from the proposed navigation channel in March of 1989 by Corps of Engineers personnel. Figure 3 shows the approximate locations of the samples. All the samples consisted of poorly graded sand with a minimal amount of fines (see Appendix A). Fines averaged 1.95%, location D contained the highest percentage of fines (4.5%). Gravel averaged 13.1% for samples taken from the dredge area. Most of the gravel (58%) occurred at location D.

No bulk chemistry data was obtained from these samples as the percentage of fines is less than 15%. Also no contaminated spills are known to have occurred in the area (White, per. comm., 1989).

b. Biological Environment

Provincetown Harbor provides habitat for a variety of marine flora. Several species of seaweeds can be observed inhabiting the embayment. Common species include rockweed Fucus spp., sponge seaweed Codium fragile, hollow green weeds Enteromorpha sp., sea lettuce Ulva lactuca, and Irish moss Chondrus crispus. The only vascular plant growing in the harbor is eelgrass Zostera marina. Approximately 200 acres of eelgrass beds occur in Provincetown Harbor (Mello, 1985). These eelgrass beds are located between approximately mean low water and six feet below MLW (Mello, 1985). Although the eelgrass beds are well established in the harbor they

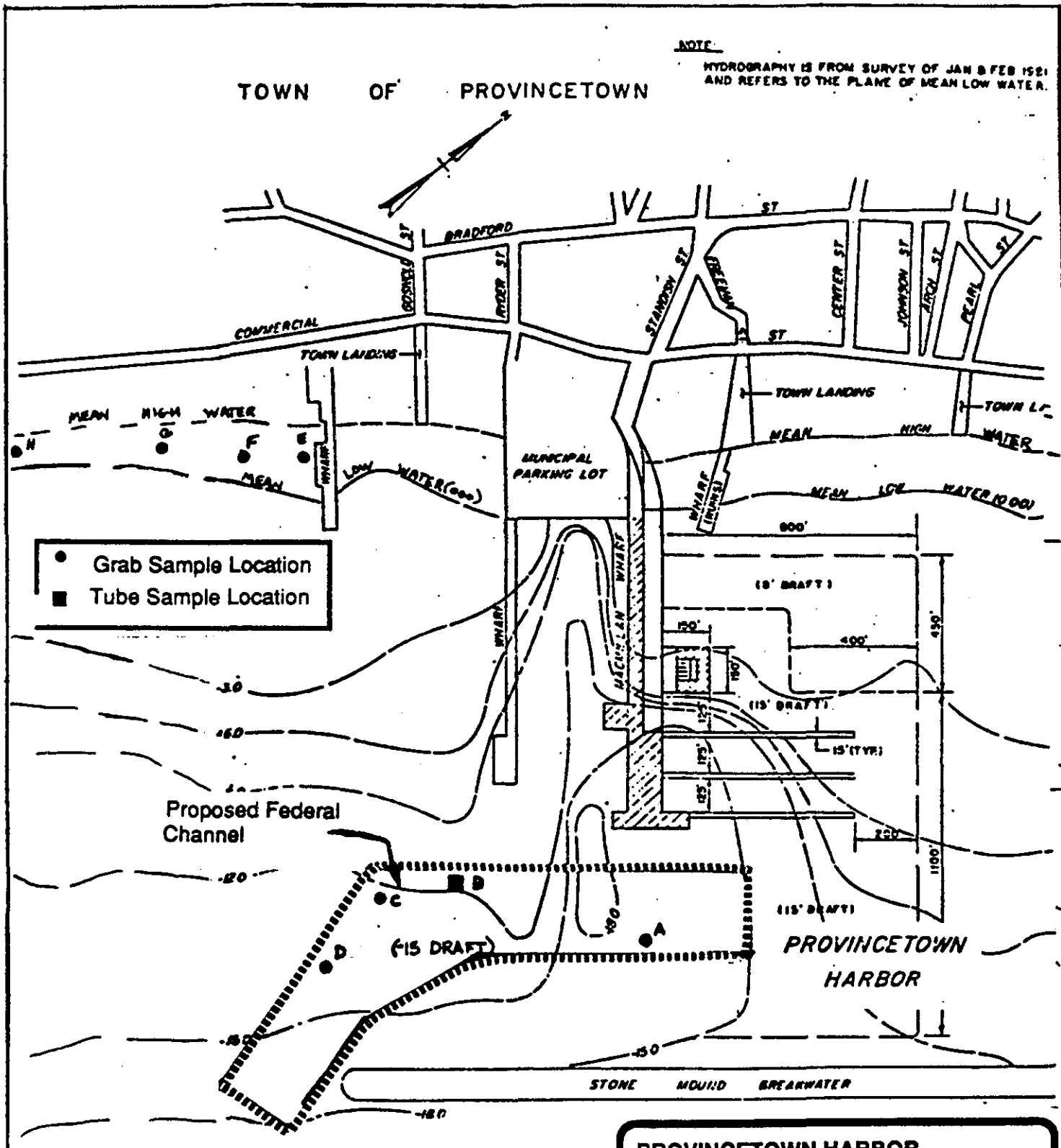


FIGURE 3

PROVINCETOWN HARBOR, MASSACHUSETTS
PROPOSED FEDERAL CHANNEL ALIGNMENT
GRAIN SIZE SAMPLING LOCATIONS

U.S ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISIONS

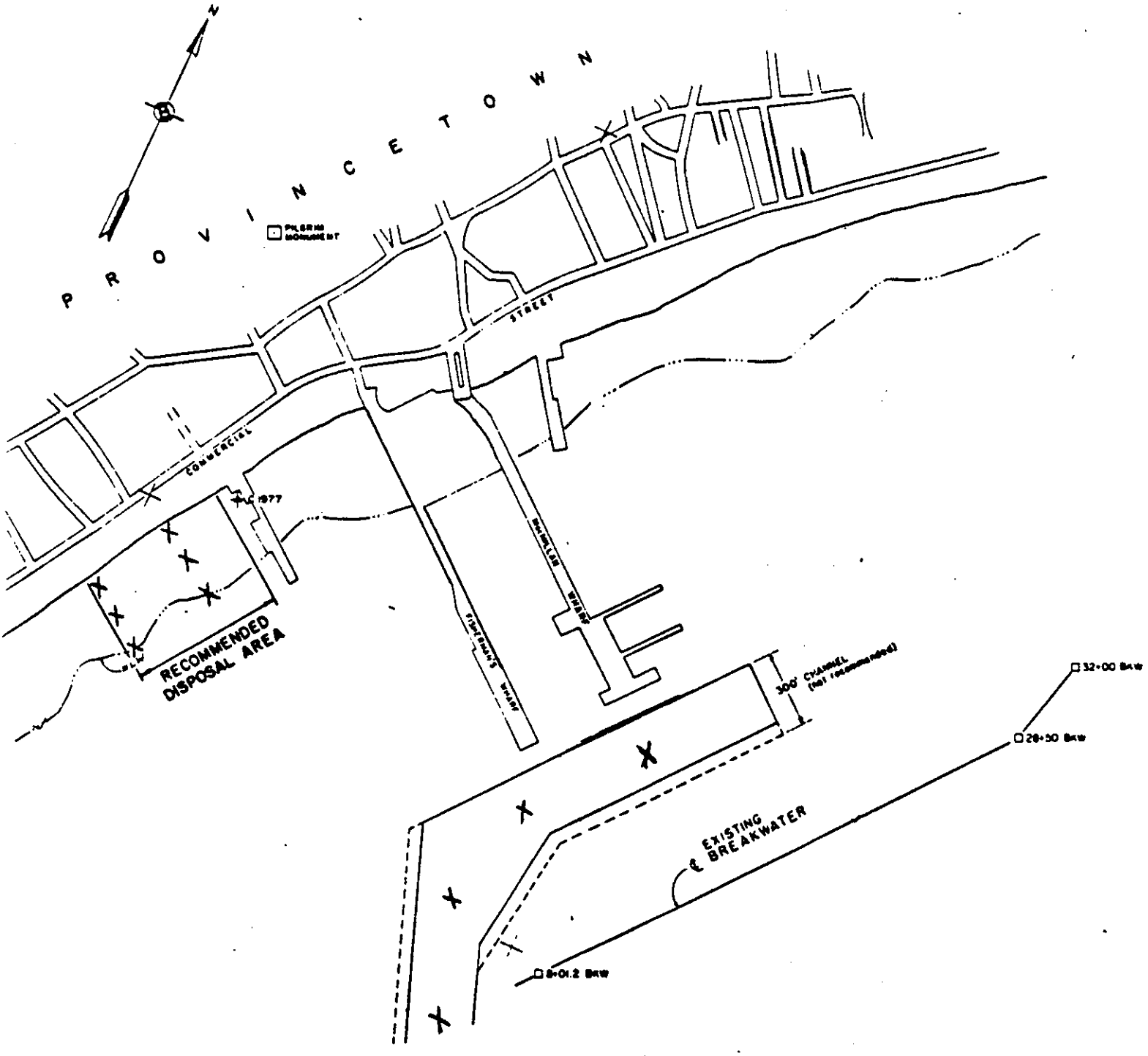


FIGURE 4

Location of Benthic Samples
Provincetown Harbor, Massachusetts

X = Benthic Locations

are sporadic and random in occurrence. The area east of MacMillan Wharf in the lee of the breakwater is very sparsely populated with eelgrass (Mello, per. comm., 1989). Grab samples taken to obtain benthic data did not reveal the presence of any eelgrass.

Personnel of the U.S. Army Corps of Engineers collected four VanVeen grab (0.04m2) samples on 23 October 1988 to determine the benthic community of the proposed channel. Figure 4 gives the approximate location of the grab samples. These samples were preserved in 10% formalin, stained with Rose Bengal, and sorted through a 0.5 mm screen. Table 1 displays the results of this survey.

TABLE 1

Benthic species were collected from the proposed channel on 23 October 1988. Numbers represent individuals per square meter.

Species	Grab Samples 1	2	3	4
Phylum Aschelminthes				
Class Nematoda	P	P	P	P
Phylum Mollusca				
Class Gastropoda				
Mitrella lunata	25			
Nassarius trivittata				625
Class Bivalvia				
Solemya velum			50	75
Nucula proxima			25	325
Aequipecten irradians				25
Thyasira sp.				150
Mercenaria mercenaria	50			
Petricola pholadiformis				25
Tellina agilis	425			
Lyonsia hyalina	50			
Macoma balthica			25	200
Phylum Annelida				
Class Polychaeta				
Phyllodoce maculata				25
Phyllodoce groenlandica	25			
Eteone heteropoda	25			25
Lepidonotus squamatus				50
Hartmania moorei				25
Glycera dibranchiata		625		175
Goniada maculata		25		
Nephtys bucera	125	1175	125	800
Exogone dispar			50	75
Syllis cornuta	650			
Nereis succinea		300		450
Nereis virens	25		75	
Capitella sp.	875	50	50	675
Sternaspis fossor				200
Sternaspis scutata	25			
Spio filicornis	150			
Scolecolepides viridis	50			
Scoletepis squamata	75			
Pygospio elegans				75
Prionospio steenstrupi	25			300
Spiophanes bombyx			75	
Aricidea jeffreysii				50
Cirratulus sp.		75	50	275
Chaetozone setosa				25
Sabella crassicornis				100

TABLE 1 (continued)

Species	Grab Samples 1	2	3	4
Potamilla reniformis			25	
Chone infundibuliformis			25	
Spirorbis spirorbis				25
Class Oligochaete			75	1825
Phylum Arthropoda				
Class Crustacea				
Edotea sp.		100		
Gammarus oceanicus	25			
Ampelisca agassizi		900		25
Corophium crassicorne		23000	10950	10500
Jassa falcata	75	12200		2300
Palaemonetes vulgaris			25	

P = Species present

The phylum Annelida, class Polychaeta contains the largest number (28) of species. However, the highest density of individuals (60100) per square meter belongs to the class Crustacea in the phylum Arthropoda. Three species from the Annelida phylum (Nepthys bucera, Capitella sp., and Oligochaete) account for 90% of the biomass from the proposed channel. The remaining species identified are contained in the phylums Mollusca and Aschelminthes. An average Shannon Diversity Index (H') of 0.6333 for the harbor samples indicates a moderate diversity of individuals among species. An evenness value (J') of 0.3809 indicates a low to moderate distribution of individuals in the population.

The number of commercial shellfish species and density recovered from the proposed channel is low (see Table 1). Although sampling by Corps personnel did not recover many shellfish, there may also be some surf clams Spisula solidissima in the area of the proposed channel. However, the quantity of surf clams is not substantial (Enos, per. comm., 1989).

Eelgrass meadows have long been considered important nursery or feeding areas for many marine species because of its ability to provide protection from predators, as substrate for attachment of sessil stages, and/or a plentiful food supply (Thayer, et. al., 1984). Finfish that utilize eelgrass for forage and habitat include small bait fish such as Atlantic silversides Menidia menidia, mummichogs Fundulus heteroclitus, killifish Fundulus spp., and juveniles of fish such as flounder (Bugley, per. comm., 1989). Other commercially and recreationally important species collected from temperate seagrass beds are bluefish Pomatomus saltatrix, tautog Tautoga unitis, and Atlantic menhaden Brevoortia tyrannus (Thayer, et. al., 1984).

Data collected by the Massachusetts Department of Marine Fisheries indicate the shallow waters of Provincetown Harbor provide habitat for the following fish species (see Appendix B). The most abundant species collected in spring bottom trawls are winter flounder Pseudopleuronectes americanus, winter skate Raja ocellata, and little skate R. erinacea. Winter flounder as well as summer flounder P. dentatus, striped bass Morone saxitilis, and bluefish are an important species for both commercial and recreational fisheries (U.S. Army Corps of Engineers, 1976). Other important species include: windowpane Scophthalmus aquosus, red hake Urophycis chuss, ocean pout Macrozoarces americanus, yellowtail flounder Limanda ferruginea, sand lance Ammodytes sp., and rock crab Cancer irroratus, and sea scallops Placopecten magellanicus. Pelagic and migratory species such as Atlantic herring Clupea harengus harengus, Atlantic menhaden, Atlantic mackerel Scomber scombrus, and striped bass Morone saxatilis may also be present.

Extensive lobstering in Provincetown Harbor occurs in the summer and beyond between the months of June and September and sometimes till November (White, per. comm., 1989). Hundreds of lobster pots are used in the inner harbor area and around the breakwater by locals to catch lobster. During the winter months the lobsters Homarus americanus move into deeper offshore waters and fishing in the harbor is minimal.

2. Disposal Site

a. Physical and Chemical Environment

The disposal site extends 600 feet from an abandoned pier located to the west of MacMillan Wharf. The beach consists of poorly graded light brown sand. Most of the area is bordered by houses, businesses and parking lots. Seawalls have been erected along portions of the disposal site to protect property from storm and wave damage. Little or no beach exists in some areas of the proposed disposal site at high tide. The beach gradually slopes to a tidal flat approximately 200 feet wide. Grain size analysis reveals the beach sediment to contain an average of 0.1% fines and 1.2% gravel (see Appendix A). Sample F contained the most gravel with 3.4%. Net littoral drift is to the west.

b. Biological Environment

Benthic and shellfish samples were taken on 31 May 1989 by staff of the U.S. Army Corps of Engineers at the proposed disposal site. Two transects were established and samples taken at mean high tide, mid-tide, and mean low water. Transect 1 was located approximately 300 feet to the west of an abandoned pier (the start of the proposed disposal site). Transect 2 was located approximately 600 feet from the pier. Figure 4 gives the approximate location of the transects.

Three replicate benthic samples were taken with a hand-held core (0.1 m2) at each station. Three replicate shellfish samples (0.4 m2) were also taken at each station and analyzed for shellfish on site. No adult size

shellfish species were found at any of the stations. Benthic samples were preserved in a 10% formalin solution, stained with Rose Bengal, and sorted through a 0.5 mm screen. Table 2 lists the species recovered from these samples.

TABLE 2

Benthic species were collected from the disposal site on 31 May 1989 at high tide, mid-tide, and low tide. Numbers represent individuals per square meter.

	Transects					
	1			2		
Species	High	Mid	Low	High	Mid	Low
Phylum Aschelminthes						
Class Nematode	P	P	P	P	P	P
Phylum Mollusca						
Class Bivalvia						
Nucula proxima	599.4	1431.9	333.0	6926.4	4162.5	2031.3
Mercenaria mercenaria	33.3	66.6		266.4	99.9	
Macoma balthica						233.1
Phylum Annelida						
Class Polychaete						
Eteone lactea			399.6			
Nephtys incisa						33.3
Exogone dispar						5094.9
Nereis sp.			33.3			66.6
Capitella sp.			4462.2			399.6
Scolecolepides viridis			566.1			
Scolelepis squamata	33.3		33.3			
Prionospio steenstrupi						99.9
Lumbrineris tenuis						632.7
Cirratulus sp.						233.1
Terebellides stroemi						99.9
Class Oligochaeta	4329.0	3130.2	2031.3	2364.3	1565.1	9224.1
Phylum Arthropoda						
Class Crustacea						
Edotea sp.			66.6			33.3
Amphipods			66.6			

P = Species present

The phylum Annelida, class Polychaeta contains the highest number of species (11) collected from the proposed disposal site. It is the class Oligochaeta within the phylum Annelida that contains the highest density of individuals per square meter (22644). The bivalve species Nucula proxima, the polychaete species Exogone dispar and Capitella sp., and Oligochaeta account for 94% of the species biomass at the proposed disposal site. The remaining species collected occur within the phylums Aschelminthes and Arthropoda. The Shannon Diversity Index (H') of 0.643 and evenness value (J') of 0.5225 indicate a moderate diversity of individuals and moderate distribution of individuals in the intertidal samples.

The moderate number of species and density at the lower intertidal zone for Transect 1 could be attributed to the oil contamination found in the samples. The contamination might be caused from the release of oil from the boats anchored at Provincetown Harbor. The bivalve species Nucula proxima was the dominant bivalve at all tide levels. Approximately the same number of dead shells were discovered at the upper tide range. This could be due to the death of juveniles during the spring/summer spawning season.

Benthic species provide food for birds along the coast. Species of birds observed during the 31 May 1989 field trip include herring gulls, great black-backed gulls, sparrows, terns, starlings, cormorants, and black terns. Waterfowl species recorded during winter surveys on Cape Cod are black duck, mallard, Canada goose, brant, goldeneye, scoter, scaup, merganser, and common eider (see Appendix B).

3. Threatened and Endangered Species

The lack of an established dune system and heavy development in the area precludes the project area as a nesting site for piping plover or least terns. Although the site could be used as a feeding area for these species. The absence of a significant input of freshwater into the harbor prevents anadromous or catadromous species from using the site as a spawning area. Other threatened and endangered species would be expected to use the site as a transient area only.

4. Historic and Archaeological Resources

Provincetown Harbor has been used as a harbor and marine resources exploitation area since the earliest days of European exploration. From the Vikings, to the early European explorers (Gosnold, Champlain) to the Pilgrims, to modern day fishermen, the attraction of the local fisheries and the promise of a harbor of refuge to avoid open-ocean storms has meant that Provincetown Harbor and the adjacent beach have been a locus of human activity. Prehistoric groups may have frequented the Provincetown area to take advantage of the marine resources (Massachusetts Historical Commission, 1984).

The inhabitants of Provincetown have historically been involved in fishing or related industries such as salt manufacture or shipbuilding.

The population has fluctuated greatly over time, depending on the status of the marine economy. During the last century, Provincetown has become a resort area, and has attracted many artists and seasonal residents.

Historic period resources within the harbor could include shipwrecks, wharves, and artifacts associated with the fishing industry (processing plants, remains of flakes) and other maritime industries which the Provincetown natives engaged in when not fishing, especially saltworks. A great number of boats have wrecked in Provincetown Harbor. A partial list is provided in Tables 3 and 4. At a public hearing in 1948, local fishermen produced a list of an additional 25 vessels lost or damaged during the period of 1940-45. In stormy weather, vessels are torn from their moorings and driven ashore. Most of the wrecked vessels are probably salvaged following the storm events. A few may have sunk and may still remain at the bottom of the harbor.

TABLE 3

SHIPS WRECKED AT PROVINCETOWN
DURING THE "PORTLAND GALE"
NOVEMBER 27, 1898

1. Schooner CARRIE E. SAYWARD
2. Schooner AGNES
3. Schooner ALLEN H. JONES
4. Sloop CARRIE LIDA
5. Schooner CHAMPION
6. Sloop ELLA FRANCIS
7. Schooner FRANK FOSTER
8. Schooner F.H. SMITH
9. Schooner HARRIE M. YOUNG
10. Sloop GRACE
11. Schooner ISAAC COLLINS
12. Schooner JORDAN L. MOTT
13. Sloop LILA
14. Schooner LETHA MAY
15. Schooner MARY CABRAL
16. Schooner SCHOOL GIRL
17. Sloop THOMAS B. REED
18. Schooner MINGUE
19. Steamer VIGILANT
20. Schooner WILLIAM A MORSE

TABLE 4
"OTHER" SHIPS WRECKED AT
PROVINCETOWN HARBOR
1700s - 1904

1. AUGUSTUS W. YATES (no date)
2. Steamer ANGELA B. NICKERSON (no date)
3. Schooner FRED & ELMER January 30, 1879
4. Schooner JUNO February, 1880
5. Schooner MINNIE F. PAINE November 25, 1888
6. Schooner PHILOMENA MANTA November 27, 1888
7. Schooner FRANKLIN November 25, 1888
8. Schooner JAMES H. TRIPP October 23, 1891
9. Schooner HELEN R. COW March 1, 1892
10. Schooner LADY LEAVITT April 21, 1893
11. Schooner PANTHER April 21, 1893
12. Schooner ROVER April 21, 1893
13. Schooner WHISTLER April 21, 1893
14. Steamer MINNIE & IRWIN August 29, 1893
15. Schooner CAVIARE December 16, 1896
16. Schooner CAPE COD June 19, 1902

Source: U.S. Engineer Office, Newport, Rhode Island. 1984. Index of Marine Disasters.

5. Social and Economic Resources

Provincetown is divided into two distinct areas; a developed area and a natural area. The major portion of the town's land area is within the Cape Cod National Seashore. The establishment of the National Seashore within Provincetown continues to attract tourists to the area. There is is an attractive long stretch of beach from Race Point to Highland Light within the National Seashore. The National Seashore facilities allow visitors to fish, swim, hunt, camp, hike, bicycle, surf and horseback ride.

The developed shoreline of Provincetown extends for about 2.5 miles along the harbor. The shoreline is almost equally divided east and west of MacMillan Wharf, the hub of waterfront activity. Provincetown's economy is supported by two industries, commercial fishing and tourism. In recent years, tourism has been assuming the role which during the last centuries was played by fishing and related activities. Commercial fishing, however, continues to provide income to over fifty percent of the town's winter population of approximately 3500. The industry is centralized at MacMillan Wharf.

Since 1980, the total yearly fish catch in both poundage and dollar value has been declining. Total fish catch in 1987 (excluding lobsters and clams) totalled 11.7 million pounds with a dollar value of $3.8 million. Some of the most common fish caught are cod, flounder, whiting, dogfish, skates, and ocean pout. The 1987 figures represent a twenty-one year low for Provincetown fish catch. It is uncertain whether this is a cyclic downturn on its way up soon or a permanent downturn. However, the town and State are committed to preserving and stimulating the Provincetown fishing industry. This is evident by the recent pier and harbor improvements funded by the town and State.

E. Environmental Consequences

1. Dredging Site

a. Physical and Chemical Effects

Shoaling of Provincetown's inner harbor has resulted in the need for dredging a navigation channel to allow safe passage of fishing vessels. Dredging the proposed channel to 13 feet below MLW would be accomplished by the use of a hydraulic dredge. The hydraulic dredge would pump the substrate from the bottom in a slurry consisting of 80% water and 20% sediment. This type of dredge produces minimal amounts of turbidity in the surrounding water. The small percentage of dredged material that becomes suspended in the water column would rapidly settle out due to the sandy nature of the substrate. Therefore, any turbidity effects associated with dredge activity would be minor and cease with the completion of the construction activity. Based on historical shoaling rates, maintenance dredging to sustain the efficiency of the project depth is expected to be required every 15 to 20 years.

The capacity of sand grains to adsorb trace metals and organic contaminants is much less than that of silts and clays. The lack of any known contaminant spills in the proposed dredge area and the minimal amount of fines (< 5%) in the substrate enable the material to be considered "clean". Release of contaminants, if any, to the water column would not be significant.

b. Biological Effects

Dredging 19,500 cubic yards of substrate from the proposed channel would destroy the benthic community and associated organisms by physical removal. Mobile species such as finfish and large macroinvertebrates such as crabs should be able to avoid the dredge area.

Several studies have been conducted to investigate the recolonization of benthos to areas that have been dredged. The first settlement of benthos is characterized by opportunistic polychaetes and immigration of mobile crustaceans. Recovery of the benthos to pre-dredge levels occurred within a year in Monterey Bay (Oliver, et. al., 1977). Species recolonization are dependent on ambient population fluctuations. Thus, the spring and summer seasons would experience the greatest recolonization of the habitat coinciding with the increased fluctuation in the ambient population (Zajac and Whitlatch, 1982).

The large number of species of polychaetes and other benthos species would indicate that the benthic community of the proposed channel is a stable and climax community. Therefore a pioneering community would colonize the newly dredged channel first and rework the sediments until it was suitable for successive communities. It is expected that within a few years the original community would reestablish the proposed channel.

2. Disposal Site

a. Physical and Chemical Effects

The use of a hydraulic dredge would cause localized turbidity during the release of the dredged material at the disposal site. The hydraulic pipeline would release slurry onto the beach into the nearshore waters. Some material may be carried away from the disposal site. However, due to the sandy nature of the substrate minimal amounts of turbidity would be expected. Turbidity would cease with the completion of the operation.

The dredged material would be deposited on the beach. Approximately 600 feet of beach would be needed to dispose of the dredged material. Bulldozers would configure the material to form a 50 foot berm with a 1:15 slope. No material would be placed below mean low water. Once the material has been placed on the beach, it would be subject to tides and littoral currents. Since the predominant direction of littoral drift is to the west, the material should not cause significant shoaling of the navigation channel. Although the predominant direction of littoral drift is to the west, the total amount of material moved is small. The

downdrift impacts should be minimal. No more than one to three percent of the dredged material placed on the beach is expected to move from the site per year. The addition of sand to the beach is not expected to cause significant shoaling in other areas of the harbor.

b. Biological Effects

The most obvious and direct effect of beach nourishment on the intertidal zone is burial of the benthos. Direct burial of nonmotile forms would generally be lethal, while motile animals might escape injury. Reilly and Bellis (1983) found that beach nourishment of Bogue Banks, North Carolina affected organism density and community structure both during and after nourishment. However, if the nourishment material is compatible with the natural beach sediments, recovery was usually rapid once the pumping operation ceased. Recovery of the intertidal area should occur within two or three seasons following the project, in most cases. Carrying out nourishment operations during the winter, when spawning of benthic organisms is minimal, would reduce consequences that are harmful to the intertidal macrofauna. The placement of compatible dredged material on the beach should encourage rapid recolonization of the intertidal zone.

Beach nourishment material would be placed above MLW. This would minimize impacts to eelgrass beds which generally grow between MLW and six feet below MLW. Beach nourishment material which is transported into the nearshore waters may have some impacts on eelgrass beds adjacent to the disposal site. Eelgrass does not respond well to rapid sedimentation, but seems to be able to respond to sediment deposition caused by its own presence (Thayer et. al., 1984). Since eelgrass can propagate itself through vegetative growth, it could be expected that eelgrass would establish itself with time once disposal is complete.

3. Threatened and Endangered Species

Coordination with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the Massachusetts Natural Heritage Office (see Appendix B) has shown that except for occasional transient species, the proposed project is not likely to have an adverse effect on Federally Threatened and Endangered Species or State rare species.

4. Historic and Archaeological Resources

Intact shipwrecks are unlikely to occur within the currently proposed dredging area. A review of harbor charts comparing the 1835 and 1909 harbor depths, and current charts, shows that there has been very little accretion of sand in the harbor during the last two centuries (80th Congress, 1948). If any ships sank within the proposed dredging area, they would likely be found sitting on the relatively shallow bottom (10 - 17 ft.) and would become hazards to navigation. At least one such vessel, the "Lydia Jane" was removed by the Corps as a hazard to navigation in August, 1899. The wreck consisted of a bottom of the boat with its ballast, lying in about 8 feet of water at mean low tide (Dept. of the Army, 1899).

No adverse effects to historic and archaeological resources are anticipated within the proposed disposal area along the shore. The area is adjacent to an abandoned wharf. The disposal of dredged material is not expected to affect the abandoned wharf or any other remains of historic structures in the beach area.

Therefore, the proposed navigation improvement project at Provincetown Harbor will not affect significant historic properties as defined by the National Historic Preservation Act of 1966, as amended. The Massachusetts Historic Commission concurred with this finding on October 6, 1989.

5. Social and Economic Resources

Improvements to MacMillan Wharf were completed in 1987 with grants from the State. Improvements included the construction of two finger piers from the east side of the town pier. Damages to vessels from southwest storm waves have been reduced by the construction of the finger piers. Dredging of a 15 foot deep MLW turning basin and 8 foot deep MLW anchorage channel on the east side of MacMillan Wharf have been or will be completed soon.

Expansion of the private marina located 400 feet to the west of MacMillan Wharf is planned for the summer of 1989. This expansion will include slips for 270 recreational boats and a floating breakwater to protect the boats from southwest winds.

Due to the improvements already in progress or anticipated for the wharf area of Provincetown Harbor, the improvement of a navigation channel is not expected to significantly increase secondary growth. The proposed Federal navigation improvement project would reduce damages commercial fishermen now experience from shoaling in the inner harbor. The proposed project would complement other improvement activities centered at MacMillan Wharf. The town and State are committed to improvements in Provincetown Harbor. Therefore the proposed project would not encourage development that would not occur already. Savings to fishermen would result in Provincetown Harbor remaining a competitive port.

F. Mitigation

To reduce potential adverse impacts to the environment from the proposed project, the following mitigation plans are required:

1. prohibit dredge and disposal activities from February 1 to August 31 of the year funding becomes available. Due to the potential impact to spawning winter flounder, the timeframe has been expanded to include this species and the many benthic species which spawn in the late spring and summer.

2. disposal of dredged material will be deposited above MHW where ever possible. Then, a bulldozer or other land moving equipment would be used to obtain the desired berm width and slope. No equipment or fill would be placed below MLW.

G. Coordination

The following agencies were contacted during the preparation of this Environmental Assessment. Their comments and concerns were incorporated into this document.

Federal Agencies

U.S. Fish and Wildlife Service, Concord, New Hampshire
National Marine Fisheries Service, Gloucester, Massachusetts
U.S. Environmental Protection Agency, Boston, Massachusetts
National Park Service, Boston, Massachusetts

State Agencies

Massachusetts Natural Heritage Program, Boston, Massachusetts
Massachusetts Division of Marine Fisheries, Boston, Massachusetts
Massachusetts Division of Water Pollution Control, Boston, Massachusetts
Massachusetts Coastal Zone Management, Boston, Massachusetts
Massachusetts Executive Office of Environmental Affairs, Boston, Massachusetts
Massachusetts Historical Commission, Boston, Massachusetts

Local Agencies

Shellfish Officer, Provincetown, Massachusetts
Provincetown Conservation Commissioner, Provincetown, Massachusetts

H. References

Department of the Army, Office of the Chief of Engineers. 1899. Annual Report upon the Improvement of Rivers and Harbors in the State of Maine, New Hampshire and Massachusetts. Annual Report of the Chief of Engineers for 1899, Appendix A. Government Printing Office, Washington.

Bugley, Karen. Massachusetts Division of Marine Fisheries, personal communication, 22 June 1989.

Enos, Robert. Provincetown Shellfish Officer, personal communication, 22 June 1989.

Massachusetts Historical Commission. 1984. Massachusetts Historical Commission Survey Report: Provincetown, Unpublished manuscript.

Mayo, Dr. Charles. Center for Coastal Studies, personal communication, 9 June 1989.

Mello, M.J. et. al. 1985. Environmental assessment of the benthic communities and sediment transport processes in Provincetown Harbor with specific reference to the proposed pier construction site, concomitant dredging, and beach nourishment. Final Report. Submitted to the Town of Provincetown by the Center of Coastal Studies, Provincetown, Massachusetts.

Oliver, J.S., P.N. Slattery L.W. Hulberg, J.W. Nybaken. 1977. Patterns of succession in benthic infauna communities following dredging and dredged material disposal in Montery Bay. Dredged Material Research Program, OCE. Washington, D.C. Technical Report D-77-27. 186 pp.

Thayer, G.W., W.J. Kenworthy, and M.S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic coast: a community profile. U.S. Fish Wildl. Serv. FWS/OBS-84/02. 147 pp.

White, Robert. Provincetown Harbor Master, personal communication, 23 June 1989.

Zajac, R.N. and R.B. Whitlatch. 1982. Responses of estuarine infauna to disturbance. Marine Ecology - Progress Series, Vol. 10: 1-14, 15-27.

80th Congress, 2nd Session, House Document No. 600. 1948. Provincetown Harbor, Massachusetts. Letters from the Secretary of the Army transmitting a letter from the Chief of Engineers, United States Army, Dated February 13, 1948, submitting a report, together with accompanying papers and an illustration, on a review of reports on Provincetown Harbor, Massachusetts, requested by a resolution of the Committee on Rivers and Harbors, House of Representatives, adopted on December 21, 1945. Government Printing Office, Washington.

I. Compliance Table

COMPLIANCE WITH ENVIRONMENTAL FEDERAL STATUTES AND EXECUTIVE ORDERS

Federal Statutes

1. Preservation of Historic and Archaeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq.

Compliance: Not Applicable; project does not require mitigation of historic or archaeological resources at this time.

2. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Coordination and submission of this report to the Regional Administrator of the Environmental Protection Agency for review pursuant to Sections 176c and 309 of the Clean Water Act signifies parital compliance.

3. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.

Compliance: A Section 404(b)(1) Evaluation and Compliance Review have been incorporated into this report. An application shall be filed for State Water Quality Certification pursuant to Section 401 of the Clean Water Act.

4. Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1431 et seq.

Compliance: A CZM consistency determination shall be provided to the State for review and concurrence that the proposed project is consistent with the approved State CZM program.

5. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with the U.S. Fish and Wildlife Service (FWS) and/or National Marine Fisheries Service (NMFS) has yielded no formal consultation requirements pursuant to Section 7 of the Endangered Species Act.

6. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Compliance: Not applicable; this report is not being submitted to Congress.

7. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Coordination with the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

8. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the FWS, NMFS, and MA Division of Marine Fisheries signifies compliance with the Fish and Wildlife Coordination Act.

9. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Submission of this report to the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

10. Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 et seq.

Compliance: Not Applicable; project does not involve the transportation nor disposal of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

11. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Compliance: Coordination with the State Historic Preservation Office determined that no historic or archaeological resources would be affected by the proposed project.

12. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.

Compliance: Preparation of this report signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

13. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for Corps' projects or programs authorized by Congress. The proposed small naviagation improvement project is pursuant to the Congressionally-approved continuing authority program; i.e. Section 107 of the River and Harbor Act of 1960.

14. Watershed Protection and Flood Prevention Act, as amended, 16 U.S.C. 1001 et seq.

Compliance: No requirements for Corps' activities.

15. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Compliance: Not Applicable; project is located within the marine environment.

Executive Orders

1. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

Compliance: Circulation of this report for public review fulfills the requirements of Executive Order 11988, Section 2(a)(2).

2. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: Not Applicable; project does not involve nor impact wetlands.

3. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not Applicable; project is located within the United States.

Executive Memorandum

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not Applicable; project does not involve nor impact agricultural lands.

II. 404 (b) (1) Evaluation

NEW ENGLAND DIVISION
U.S. ARMY CORPS OF ENGINEERS, WALTHAM, MA
SECTION 404(b)(1) EVALUATION

PROJECT: Provincetown Harbor, Provincetown, Massachusetts
Small Navigation Improvement Project

PROJECT MANAGER: Robert Russo EXT. (617) 647-8547

FORM COMPLETED BY: Catherine Demos EXT. (617) 647-8231

PROJECT DESCRIPTION:

Sand shoaling of the navigation channel from the town pier "MacMillan Wharf" to deep water just outside the Federal breakwater has caused tidal delays, and some grounding and dragging damages for deep draft (>10 feet) commercial fishing boats attempting to enter or leave the town pier area. The proposed project would establish a 13 foot deep MLW, 250 foot wide channel from the town pier to deep water just outside the Federal breakwater. The sandy material would be hydraulically pumped from the channel to a 600 foot long section of beach located to the west of the town pier.

NEW ENGLAND DIVISION
U.S. ARMY CORPS OF ENGINEERS, WALTHAM, MA

PROJECT: Provincetown Harbor, Provincetown, Massachusetts

SHORT-FORM
Evaluation of Section 404(b)(1) Guidelines

1. Review of Compliance (Section 230.10(a)-(d)). Final

a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose (if no, see section 2 and information gathered for EA alternative);

[x] YES [ ] NO

b. The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their critical habitat; and 3) violate requirements of any Federally designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies);

[x] YES [ ] NO

c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values (if no, see section 2);

[x] YES [ ] NO

d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see section 5).

[x] YES [ ] NO

2. Technical Evaluation Factors (Subparts C-F).

	N/A	Not Signif-icant	Signif-icant*
a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C).			
1) Substrate.		x	
2) Suspended particulates/turbidity.		x	
3) Water.		x	
4) Current patterns and water circulation.	x		
5) Normal water fluctuations.	x		
6) Salinity gradients.	x		
b. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D).			
1) Threatened and endangered species.	x		
2) Fish, crustaceans, mollusks and other aquatic organisms in the food web.		x	
3) Other wildlife.		x	
c. Potential Impacts on Special Aquatic Sites (Subpart E).			
1) Sanctuaries and refuges.	x		
2) Wetlands.	x		
3) Mud flats.	x		
4) Vegetated shallows.		x	
5) Coral reefs.	x		
6) Riffle and pool complexes.	x		
d. Potential Effects on Human Use Characteristics (Subpart F).			
1) Municipal and private water supplies.	x		
2) Recreational and Commercial fisheries.		x	
3) Water-related recreation.		x	
4) Aesthetics.		x	
5) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves.	x		

3. Evaluation and Testing (Subpart G).

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)

1) Physical characteristics..... [x]
2) Hydrography in relation to known or anticipated sources of contaminants..... [x]
3) Results from previous testing of the material or similar material in the vicinity of the project..... [ ]
4) Known, significant sources of persistent pesticides from land runoff or percolation..... [ ]
5) Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)..... [ ]
6) Public records of significant introduction of contaminants from industries, municipalities, or other sources..... [ ]
7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities..... [ ]
8) Other sources (specify)..... [ ]

List appropriate references.

Provincetown Harbor Environmental Assessment

b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredge or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria. [x] YES [ ] NO*

4. Disposal Site Delineation (Section 230.11(f)).

a. The following factors, as appropriate, have been considered in evaluating the disposal site.

1) Depth of water at disposal site..... [ ]
2) Current velocity, direction, and variability at disposal site..... [x]
3) Degree of turbulence..... [ ]
4) Water column stratification..... [ ]
5) Discharge vessel speed and direction..... [ ]
6) Rate of discharge..... [ ]
7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)..... [x]
8) Number of discharges per unit of time..... [ ]
9) Other factors affecting rates and patterns of mixing (specify)..... [ ]

List appropriate references.

Provincetown Harbor Environmental Assessment

b. An evaluation of the appropriate factors in 4a above indicates that the disposal site and/or size of mixing zone are acceptable..... [x] YES [ ] NO

5. Actions To Minimize Adverse Effects (Subpart H).

All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge..... [x] YES [ ] NO*

List actions taken.

1) Dredging and disposal activities will be limited to the September 1 through January 31 time period.

2) Disposal of dredged material will be deposited above MLW where possible. No equipment of fill will be placed below MLW.

6. Factual Determination (Section 230.11).

A review of appropriate information as identified in items 2 - 5 above indicates that there is minimal potential for short or long term environmental effects of the proposed discharge as related to:

a. Physical substrate (review sections 2a, 3, 4, and 5 above). YES [x] NO [ ]

b. Water circulation, fluctuation and salinity (review sections 2a, 3, 4, and 5). YES [x] NO [ ]

c. Suspended particulates/turbidity (review sections 2a, 3, 4, and 5). YES [x] NO [ ]

d. Contaminant availability (review sections 2a, 3, and 4). YES [x] NO [ ]

e. Aquatic ecosystem structure, function and organisms(review sections 2b and c, 3, and 5) YES [x] NO [ ]

f. Proposed disposal site (review sections 2, 4, and 5). YES [x] NO [ ]

g. Cumulative effects on the aquatic ecosystem. YES [x] NO [ ]

h. Secondary effects on the aquatic ecosystem. YES [x] NO [ ]

7. Findings of Compliance or non-compliance.

a. The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines..... [x]

16 April 1990
DATE

DANIEL M. WILSON
Colonel, Corps of Engineers
Division Engineer

FINDING OF NO SIGNIFICANT IMPACT

The proposed small navigation improvement project at Provincetown Harbor, Provincetown, Massachusetts would provide for the establishment of a 2,500 foot long Federal navigation channel from deep water outside the Federal breakwater to MacMillan Wharf, the town pier. This would involve hydraulically dredging approximately 19,500 cubic yards of sandy material to form a 13-foot deep MLW and 250 foot wide channel. The dredged material would be pumped to a 600 foot long section of beach located to the west of the town pier.

The Finding of No Significant Impacts, from information presented in the Environmental Assessment, is attributable to the following considerations:

1. The temporary loss of a benthic community would not cause sustained or substantial impact to the ecological integrity of the harbor's aquatic resources. The benthic community is expected to reestablish itself within a few years.

2. The proposed project would not affect any endangered and/or threatened species, or cultural resources.

3. The dredging operations would be scheduled during the period September 1 through January 31. This would reduce impacts to the spawning winter flounder and benthic species.

4. The generation of suspended material and turbidity would cease with the discontinuation of dredge activity and would be localized due to the coarse nature of the material being dredged. No other water quality impacts are anticipated.

5. Coordination with appropriate Federal, State, and local agencies insured that concerns and comments were made known to the Corps which were considered in the planning process. These agencies expressed no overriding environmental concerns associated with this project.

6. The proposed project complies with all applicable Environmental Statues and Executive Orders.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that this Provincetown Harbor Improvement Project is not a major Federal action significantly affecting the quality of the human environment and is, therefore, exempt from requirements to prepare an Environmental Impact Statement.

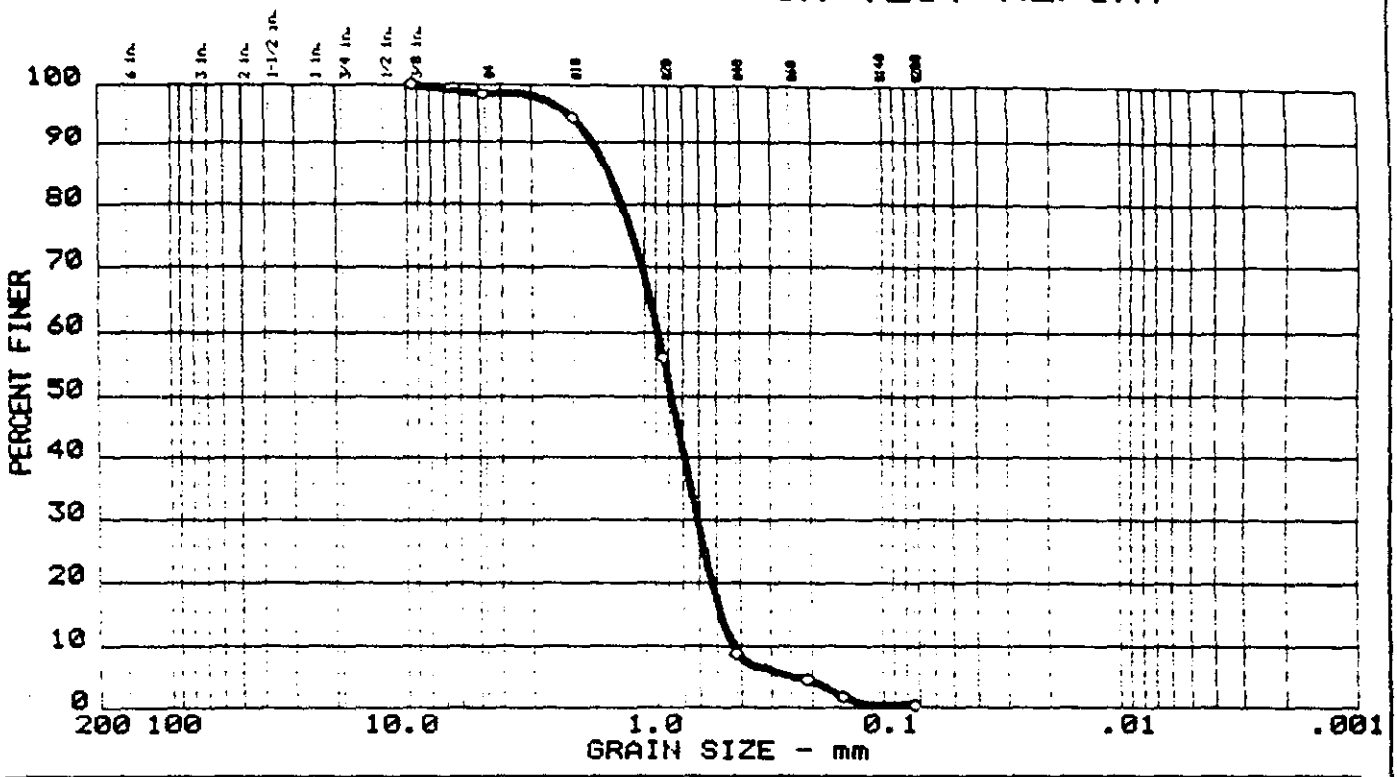
16 April 1990
DATE

DANIEL M. WILSON
Colonel, Corps of Engineers
Division Engineer

APPENDIX A

GRAIN SIZE ANALYSIS

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	1	0.0	1.8	97.7	0.5	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			1.13	0.88	0.77	0.606	0.5675	0.4355	0.95	2.0

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. A-1	SP	

Project No.: 100-493-1
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

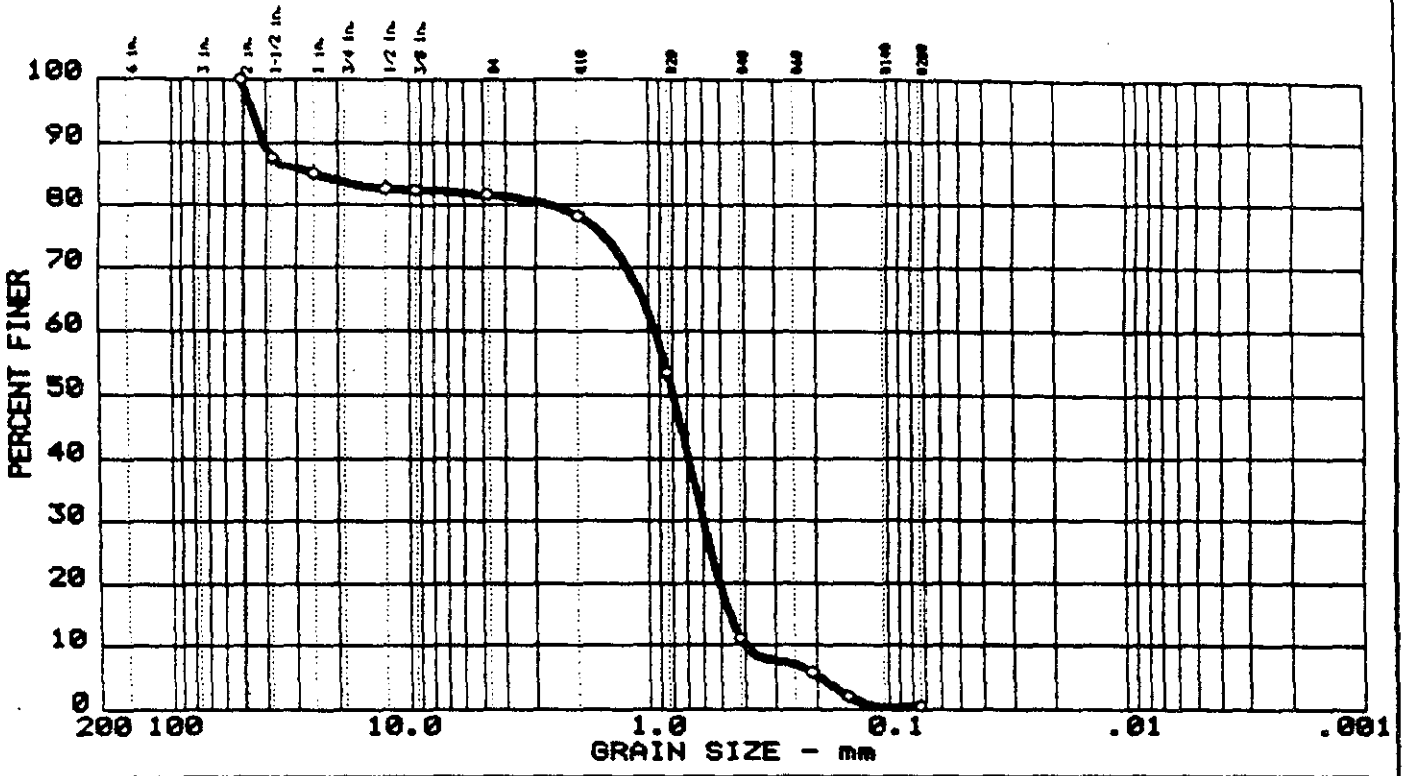
Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: DARK GREY
SPECIFIC GRAVITY: 2.66

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-2

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	2	0.0	18.3	81.1	0.6	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			1.53	0.94	0.79	0.596	0.5540	0.4013	0.94	2.4

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. B-1	SP	

Project No.: 100-493-2
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE (TOP OF TUBE)

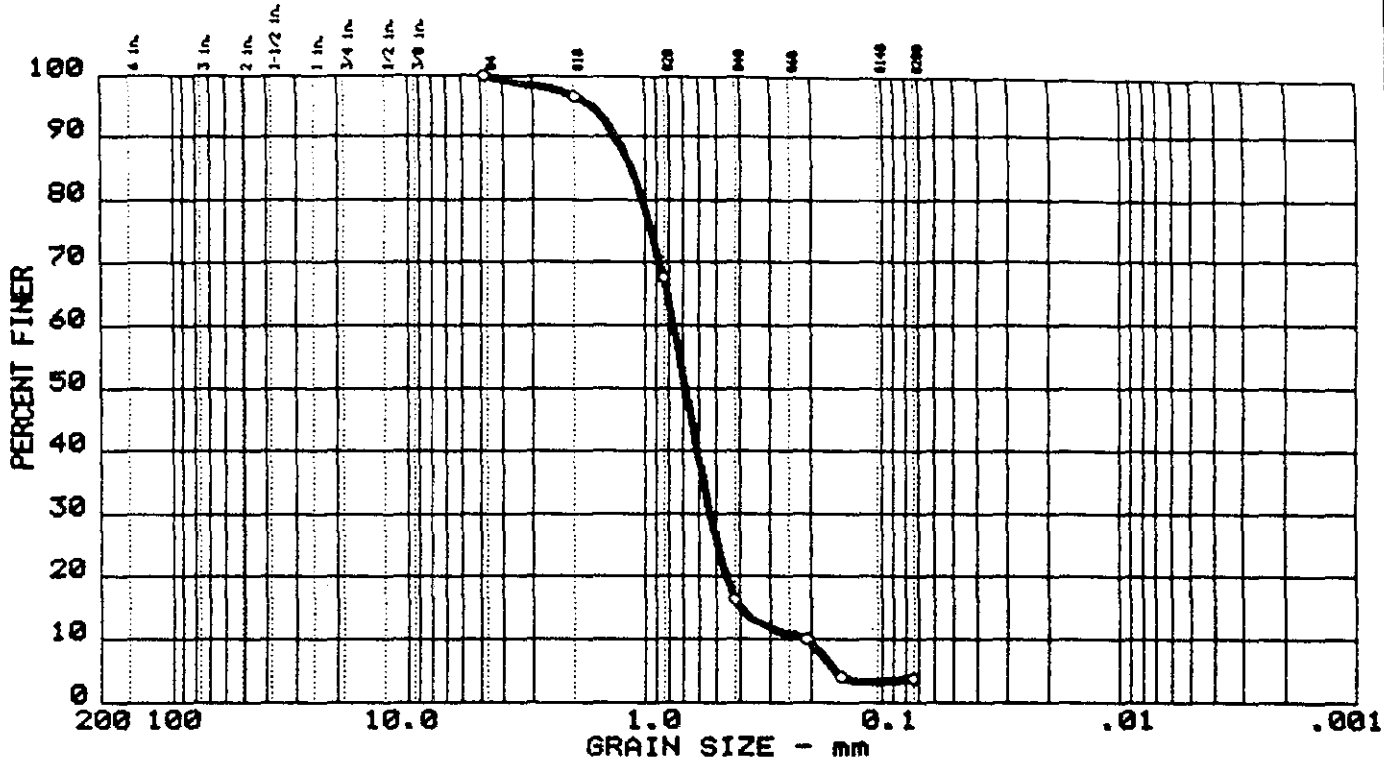
Date: 3-25-89

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Remarks:
POORLY GRADED SAND
WITH GRAVEL, COLOR: GREY
AVERAGE TUBE W/C: 17.6%
DRY DENSITY: 115.50 PCF

Fig. No. 2-3

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	3	0.0	0.0	96.3	3.7	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			0.94	0.76	0.68	0.533	0.4972	0.2073	1.80	3.7

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. B-2	SP	

Project No.: 100-493-2
Project: PROVINCETOWN HARBOR , MASS.
o Location: 1.17 FT. DEPTH (BOTTOM OF TUBE)

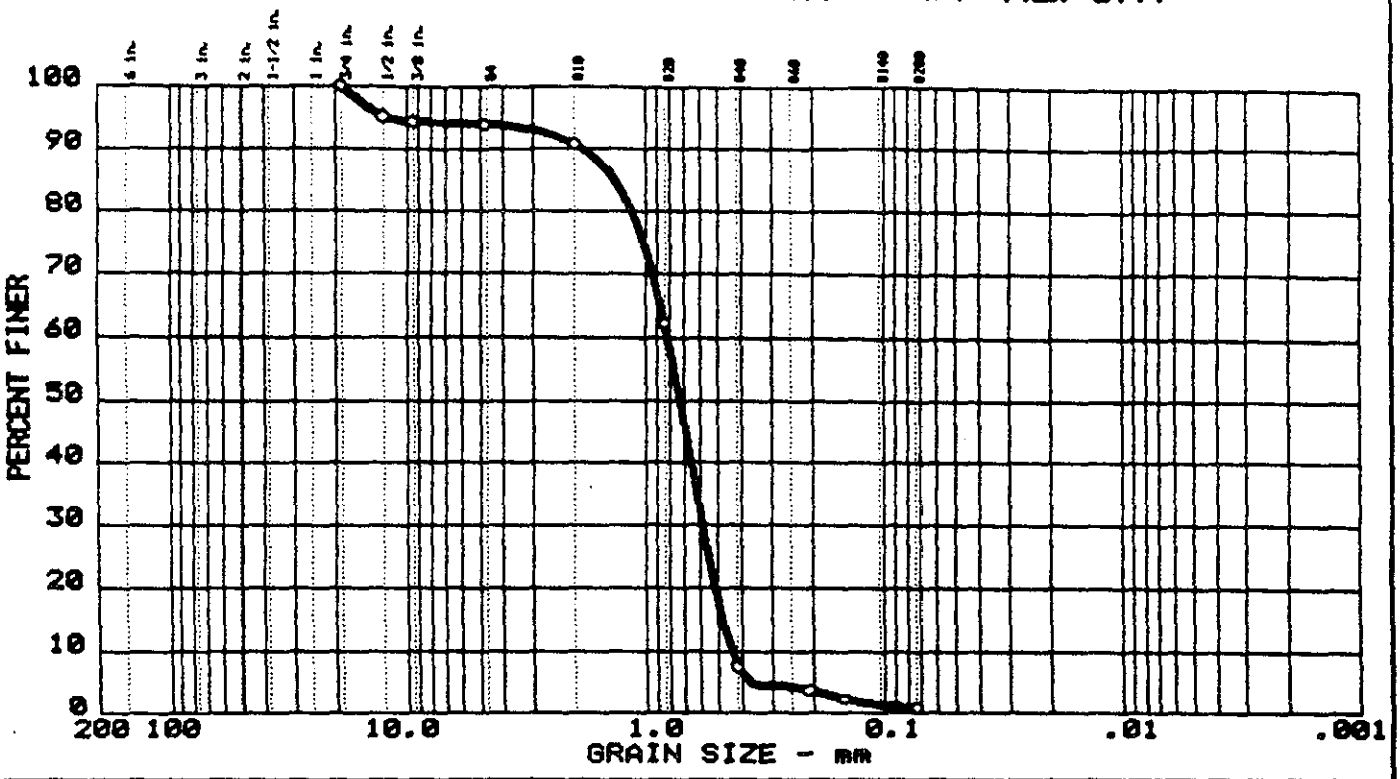
Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: BROWNISH GREY
AVERAGE TUBE W/C: 17.6%
DRY DENSITY: 115.50 PCF

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-4

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	4	0.0	5.9	93.3	0.8	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			1.03	0.82	0.73	0.585	0.5521	0.4436	0.95	1.8

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. B-3	SP	

Project No.: 100-493-3
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

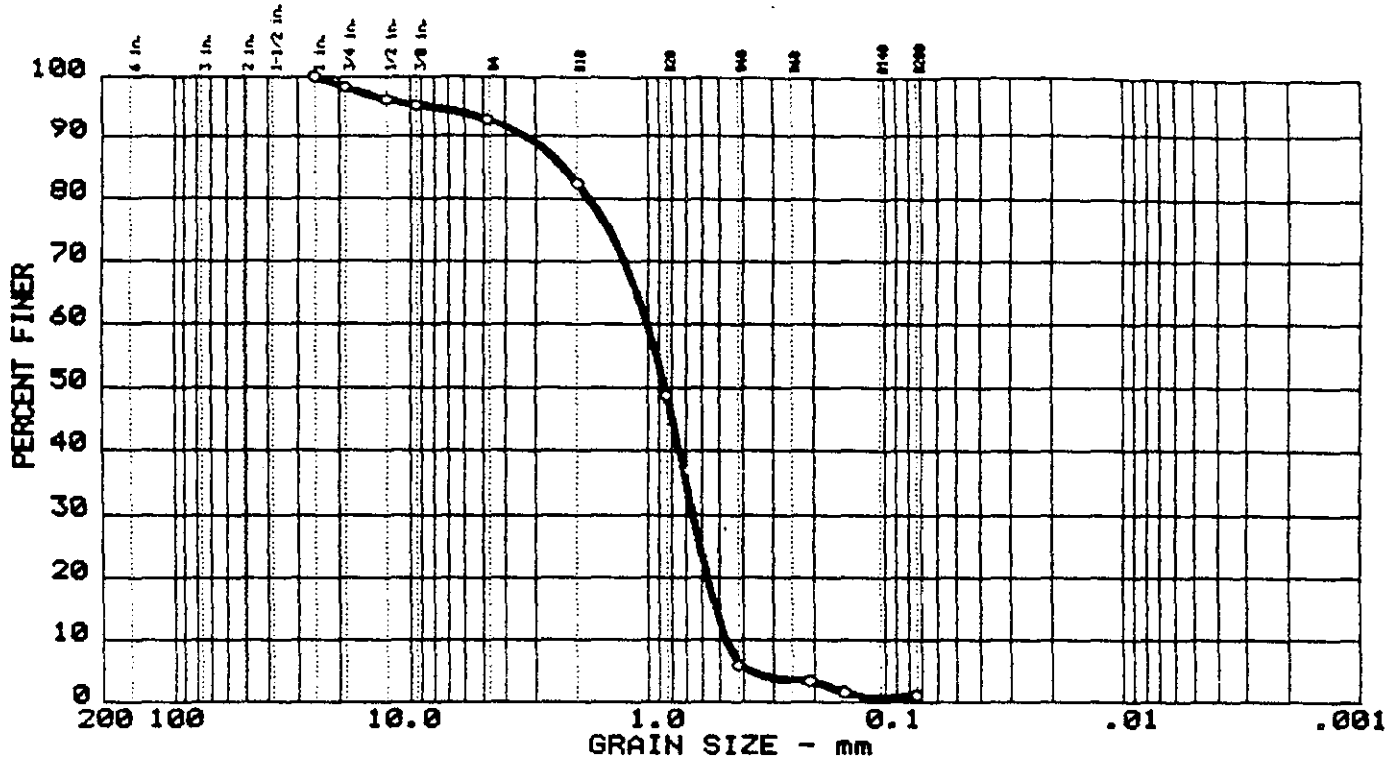
Date: 3-25-89

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Remarks:
POORLY GRADED SAND
COLOR: DARK GREY
CONTAINS SHELL FRAGMENTS

Fig. No. 2-5

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	5	0.0	7.3	91.6	1.1	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			1.47	1.01	0.85	0.650	0.6067	0.4748	0.88	2.1

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. C-1	SP	

Project No.: 100-493-4
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

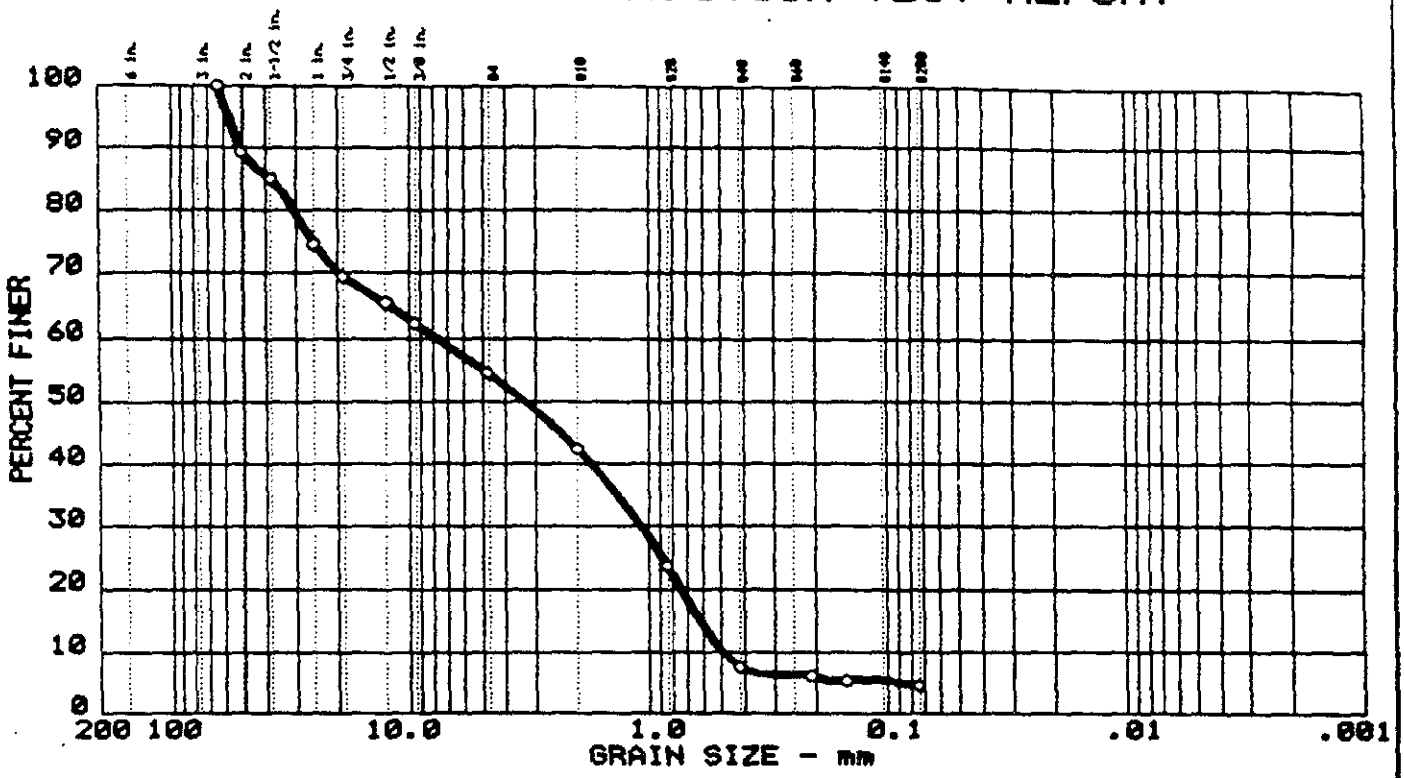
Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: DARK GREY
CONTAINS SHELL FRAGMENTS

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-6

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	6	0.0	45.4	50.1	4.5	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			25.91	7.65	3.30	1.080	0.8780	0.4881	0.31	15.7

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. D-1	SP	

Project No.: 100-493-5
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

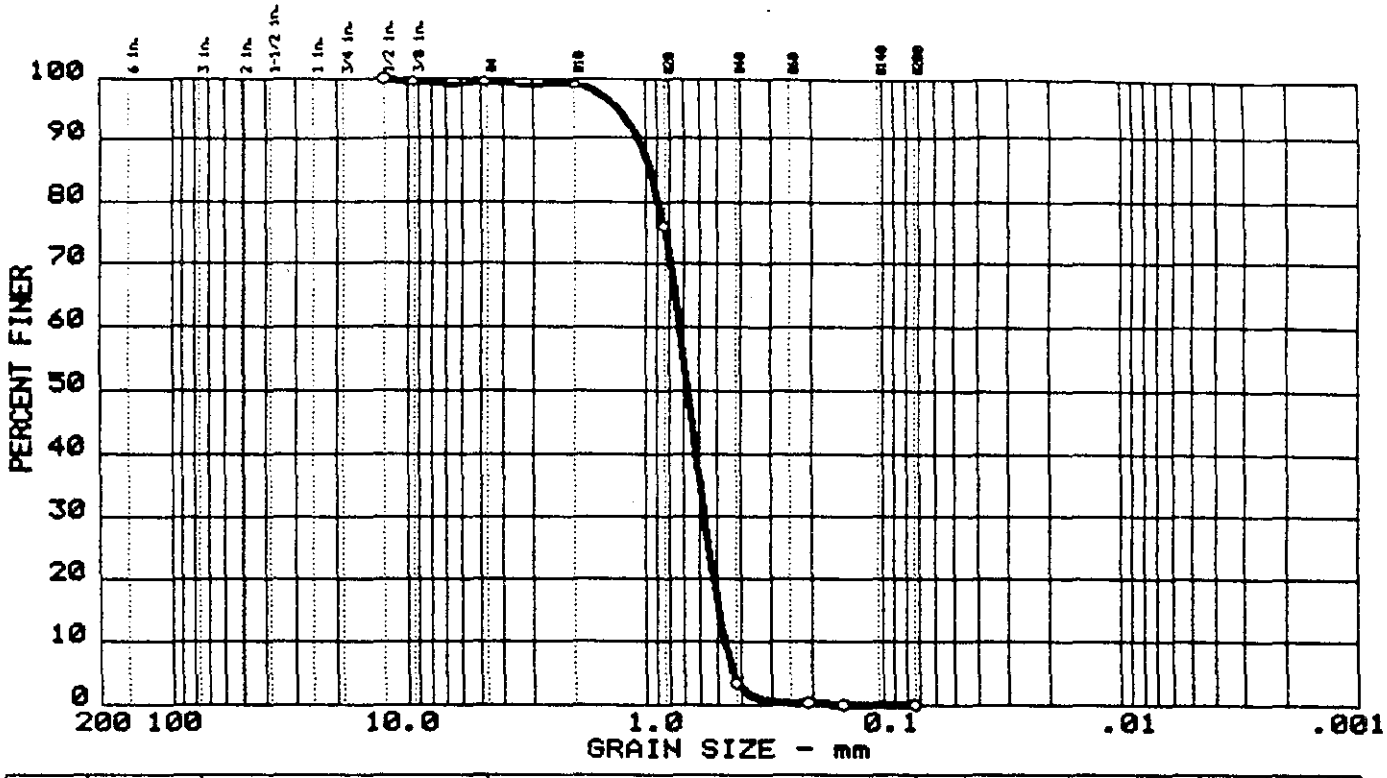
Date: 3-25-89

Remarks:
POORLY GRADED SAND
WITH GRAVEL, COLOR: GREY
CONTAINS SHELL FRAGMENTS
SPECIFIC GRAVITY: 2.64

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-7

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	7	0.0	0.6	99.4	0.0	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			0.83	0.72	0.66	0.568	0.5451	0.4688	0.96	1.5

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. E-1	SP	

Project No.: 100-493-6
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

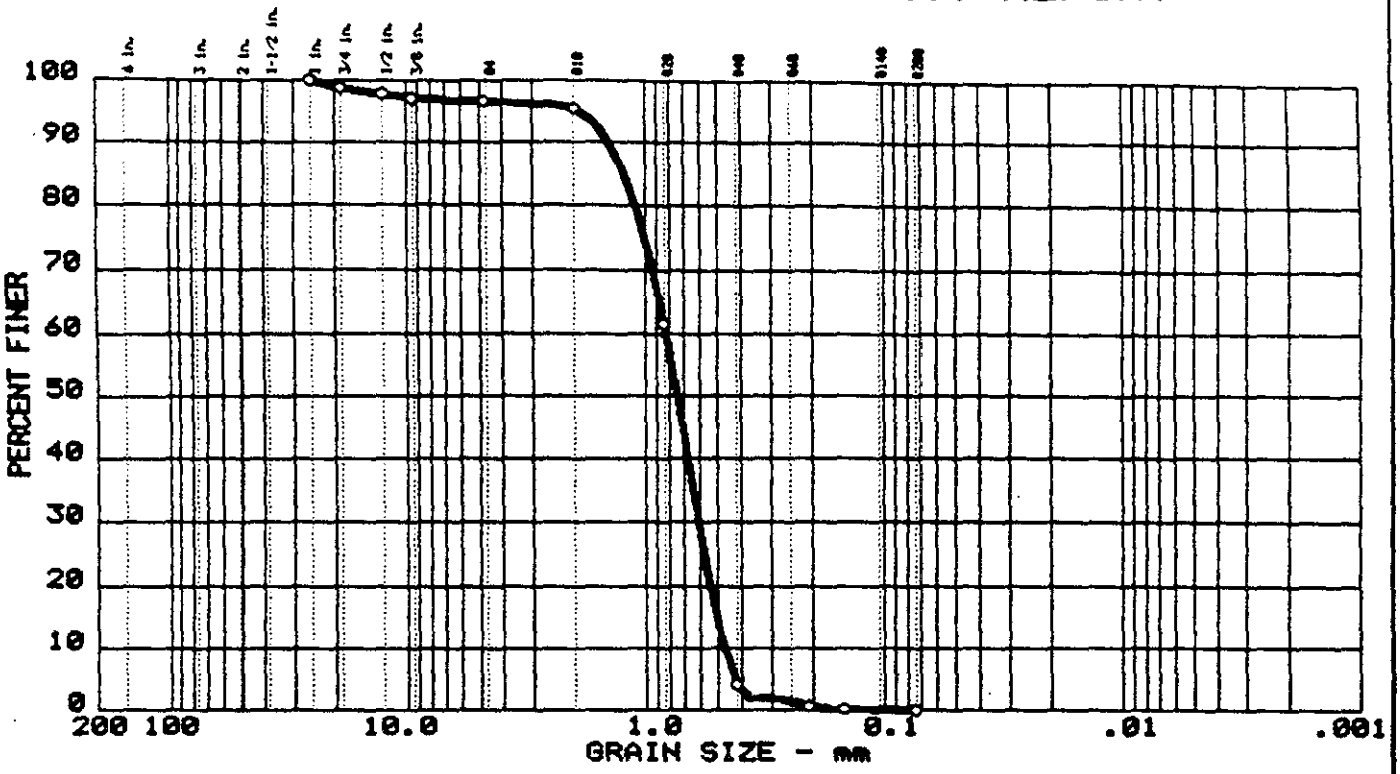
Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: LIGHT BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-8

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	8	0.0	3.4	96.5	0.1	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			1.01	0.82	0.74	0.603	0.5715	0.4726	0.93	1.7

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. F-1	SP	

Project No.: 100-493-7
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

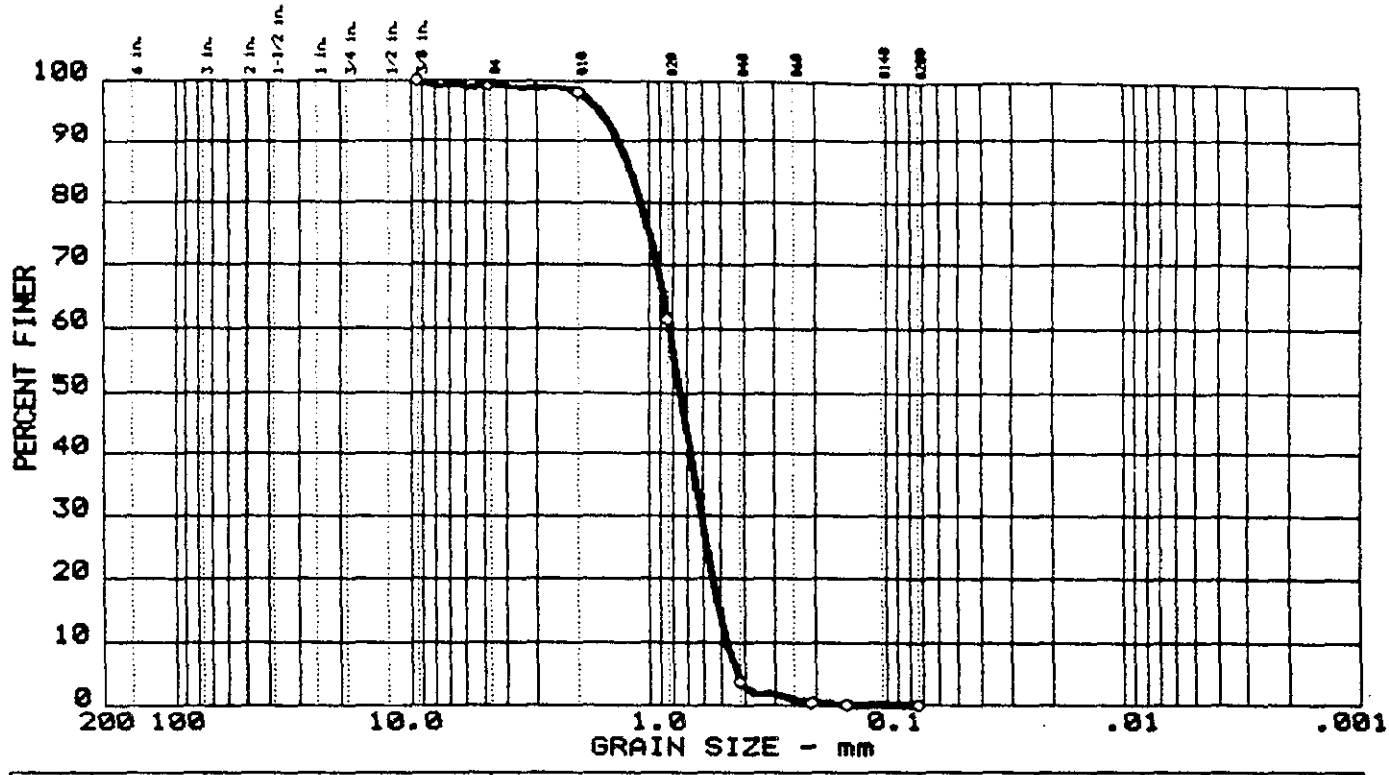
Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: LIGHT BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-9

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	9	0.0	0.9	99.0	0.1	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			1.00	0.83	0.74	0.607	0.5768	0.4775	0.94	1.7

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. G-1	SP	

Project No.: 100-493-8
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

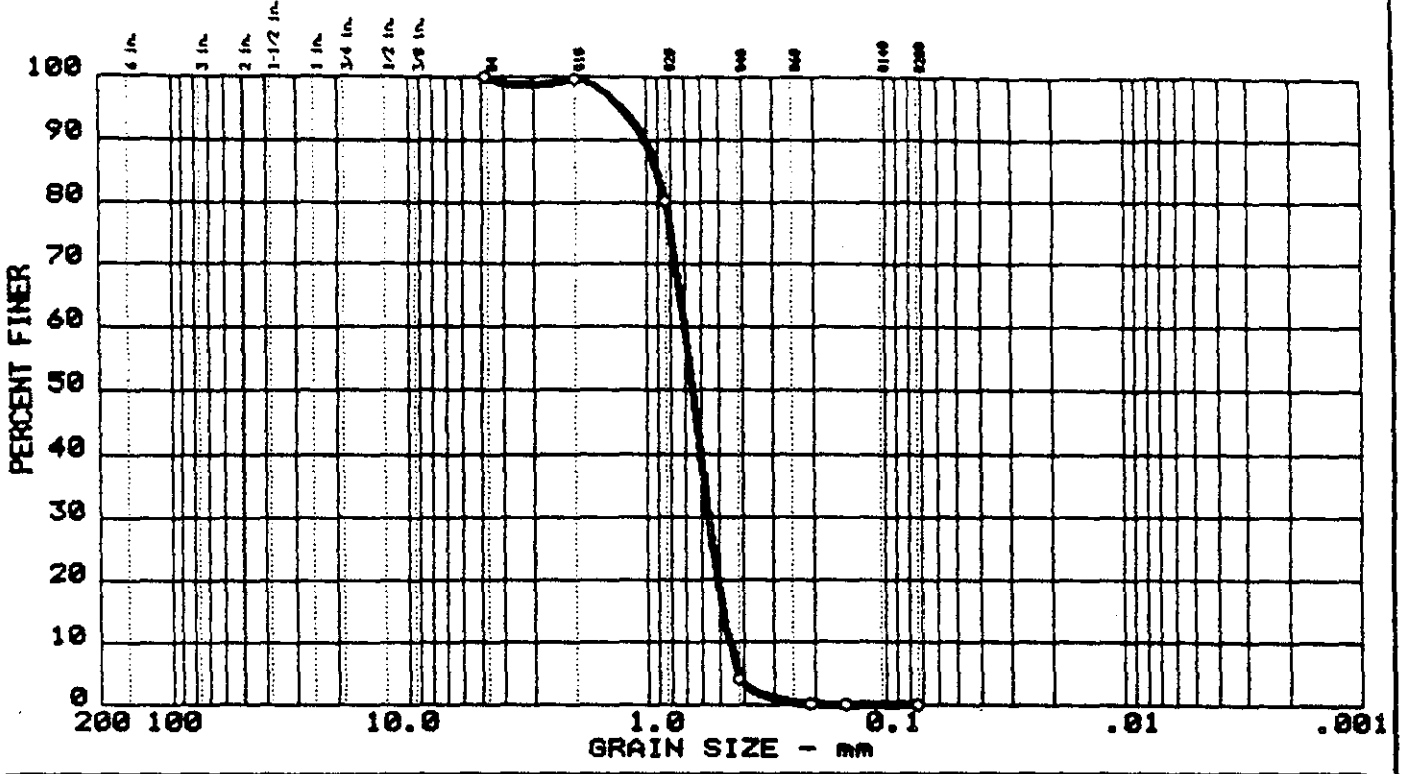
Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: LIGHT BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-10

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
o	10	0.0	0.0	99.9	0.1	

	LL	PI	D_{75}	D_{60}	D_{50}	D_{30}	D_{25}	D_{10}	C_c	C_u
o			0.79	0.70	0.65	0.556	0.5339	0.4613	0.96	1.5

MATERIAL DESCRIPTION	USCS	AASHTO
o SAMPLE NO. H-1	SP	

Project No.: 100-493-9
Project: PROVINCETOWN HARBOR , MASS.
o Location: SURFACE

Date: 3-25-89

Remarks:
POORLY GRADED SAND
COLOR: LIGHT BROWN

GRAIN SIZE DISTRIBUTION TEST REPORT
CORPS OF ENGINEERS - NEW ENGLAND

Fig. No. 2-//

APPENDIX B

COORDINATION LETTERS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Region
Management Division
Habitat Conservation Branch
One Blackburn Drive
Gloucester, MA. 01930-2298

July 12, 1989

Mr. Joseph L. Ignazio, Chief
Planning Division, NED
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254-9149

Dear Mr. Ignazio:

This is in response to your letter regarding the presence of endangered or threatened species under the jurisdiction of the National Marine Fisheries Service in the vicinity of Provincetown, Massachusetts. Although there are several endangered whale species that inhabit both the Massachusetts and Cape Cod Bays near Provincetown, whales are not known to frequent the either the proposed dredge area behind the breakwater or the nearby beach disposal site. This information will allow us to conclude that the proposed Section 107 Navigation Improvement Project in Provincetown Harbor is not likely to adversely affect endangered species under our jurisdiction. Therefore, there is no need for further consultation pursuant to Section 7 of the Endangered Act of 1973, as amended. Should project plans change or new information become available that changes the basis for this determination, then consultation should be reinitiated.

Sincerely,

Douglas W. Beach
Wildlife Biologist

The Commonwealth of Massachusetts
Division of Marine Fisheries
Leverett Saltonstall State Office Building
100 Cambridge Street
Boston, Massachusetts 02202
727-3193

PHILIP G. COATES
DIRECTOR

July 3, 1989

Catherine Demos
U.S. Army Corps of Engineers
New England Division
ATTN: Planning Division
Impact Analysis Branch
424 Trapelo Road
Waltham, MA 02554-9149

Dear Ms. Demos:

The Division of Marine Fisheries has reviewed the proposed Provincetown Harbor dredging project. We have no objection to this project since significant numbers of shellfish do not reside within the proposed dredging area and it is not a significant finfish spawning ground. Also the disposal site does not pose a problem for marine resources.

Sincerely,

Philip G. Coates
Director

PGC/mc

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

May 22, 1989

Mr. Carl G. Boutilier
Chief, Navigation Branch
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Mr. Boutilier:

This is in response to your letter of April 14, 1989, requesting our comments on the proposed establishment of a Federal navigation channel for Provincetown Harbor, in Provincetown, Massachusetts.

We understand that the proposed project would establish a Federal navigation channel 4,000 feet long from just outside the Federal breakwater to MacMillian Wharf(the town pier). Approximately 46,000 cubic yards of sandy material would be removed with a hydraulic dredge and pumped onto the beach southwest of the town pier. The material would be used for beach nourishment with approximately 1200 linear feet of beach replenished.

Provided that the sediment analysis indicates that the dredged material is acceptable for beach nourishment, we do not anticipated any significant adverse environmental effects to occur from intiation of this project. However, if it is determined that the dredged material is not acceptable for beach nourishment, please contact this office for further coordination on alternative disposal options.

We appreciate the opportunity to comment on this project. For further coordination on this project contact Melvin P. Holmes at 617 565-4433.

Sincerely,

Douglas A. Thompson, Chief
Wetlands Protection Section

cc: NMFS, Gloucester, MA
USFWS, Concord, NH

United States Department of the Interior

FISH AND WILDLIFE SERVICE
400 RALPH PILL MARKETPLACE
22 BRIDGE STREET
CONCORD, NEW HAMPSHIRE 03301-4901

Mr. Joseph Ignazio, Chief
Planning Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

April 26, 1989

ATTN: Impact Analysis Branch

Dear Mr. Ignazio:

This responds to your letter dated April 14, 1989, for information on the presence of Federally listed and proposed endangered or threatened species in accordance with a proposed Navigation Improvement Project in Provincetown, Massachusetts.

No Federally listed or proposed threatened and endangered species under our jurisdiction are known to occur in the project area, with the exception of occasional transient individuals. However, you may wish to contact Brad Blodgett of the Massachusetts Division of Fisheries and Wildlife, Rte. 135, North Drive, Westboro, Massachusetts, at 508-366-4470, for information on state listed species. No Biological Assessment or further consultation is required with us under Section 7 of the Endangered Species Act. Should project plans change, or additional information on listed or proposed species becomes available, this determination may be reconsidered.

This response relates only to endangered species under our jurisdiction. It does not address other legislation or our responsibilities under the Fish and Wildlife Coordination Act.

A list of Federally designated endangered and threatened species in Massachusetts is inclosed for your information. Thank you for your cooperation and please contact Susi von Oettingen of this office at 603-225-1411 if we can be of further assistance.

Sincerely yours,

Gordon E. Beckett

Inclosure

Gordon E. Beckett
Supervisor
New England Area

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN MASSACHUSETTS

Common Name	Scientific Name	Status	Distribution
FISHES:			
Sturgeon, shortnose*	Acipenser brevirostrum	E	Connecticut River & Atlantic Coastal Waters
REPTILES:			
Turtle, green*	Chelonia mydas	T	Oceanic straggler in Southern New England
Turtle, hawksbill*	Eretmochelys imbricata	E	Oceanic straggler in Southern New England
Turtle, leatherback*	Dermochelys coriacea	E	Oceanic summer resident
Turtle, loggerhead*	Caretta caretta	T	Oceanic summer resident
Turtle, Atlantic ridley*	Lepidochelys kempii	E	Oceanic summer resident
Turtle, Plymouth red-bellied	Chrysemys rubriventris bangsi	E	Plymouth & Dukes Counties
BIRDS:			
Eagle, bald	Haliaeetus leucocephalus	E	Entire state
Falcon, American peregrine	Falco peregrinus anatum	E	Entire state-reestablishment to former breeding range in progress
Falcon, Arctic peregrine	Falco peregrinus tundrius	E	Entire state migratory-no nesting
Plover, Piping	Charadrius melodus	T	Atlantic coast
Roseate Tern	Sterna dougallii dougallii	E	Atlantic Coast
MAMMALS:			
Cougar, eastern	Felis concolor couguar	E	Entire state-may be extinct
Whale, blue*	Balaenoptera musculus	E	Oceanic
Whale, finback*	Balaenoptera physalus	E	Oceanic
Whale, humpback*	Megaptera novaeangliae	E	Oceanic
Whale, right*	Eubalaena spp. (all species)	E	Oceanic
Whale, sei*	Balaenoptera borealis	E	Oceanic
Whale, sperm*	Physeter catodon	E	Oceanic
MOLLUSKS: NONE			
PLANTS:			
Small Whorled Pogonia	Isotria medeoloides	E	Hampshire, Essex Hampden, Worcester Middlesex Counties
Gerardia, Sandplain	Agalinus acuta	E	Barnstable County

* Except for sea turtle nesting habitat, principal responsiblity for these species is vested with the National Marine Fisheries Service

Rev. 1/20/89

United States Department of the Interior

FISH AND WILDLIFE SERVICE
400 RALPH PILL MARKETPLACE
22 BRIDGE STREET
CONCORD, NEW HAMPSHIRE 03301-4901

Joseph L. Ignazio
Chief, Planning Division
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

June 27, 1989

Dear Mr. Ignazio:

This is in response to your letter of April 19, 1989, requesting our comments on the proposed navigation improvement project in Provincetown Harbor, Provincetown, Massachusetts. We provided comments on the project pursuant to the Endangered Species Act in our letter of April 26, 1989. The following comments are provided under authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).

We understand the proposed project would establish a federal navigation channel 2500 feet long and 13 feet deep, from the federal breakwater to MacMillian Wharf, the town fish pier. Approximately 19,500 cubic yards of sandy material would be hydraulically dredged, with disposal on 600 linear feet of beach southwest of the town pier.

Data provided by the Massachusetts Department of Marine Fisheries indicate the shallow waters of Provincetown Harbor provide habitat for a variety of fish species. The most abundant species collected in spring bottom trawls are: winter flounder, winter skate, and little skate. Winter flounder is an important species for both commercial and recreational fisheries, and both juveniles and adults are found within Provincetown Harbor. Other important species include: windowpane, red hake, ocean pout, yellowtail flounder, sand lance, lobster, rock crab, and sea scallops. Pelagic and migratory species such as Atlantic herring, river herring, Atlantic menhaden, Atlantic mackerel, bluefish, and striped bass may also be present.

Quahogs and soft-shelled clams may be found in the project area, however, neither the dredge nor beach disposal sites are reported to be significant shellfish production areas. We understand that the Corps has sampled both the dredge and disposal sites for benthic invertebrates. The sample results are not yet available for review.

We would expect the predominate wildlife of the project area to be avian species, including seabirds and waterfowl. Among the waterfowl species recorded during winter surveys on Cape Cod are black duck, mallard, Canada goose, brant, goldeneye, scoter, scaup, merganser, and common eider. The proposed beach nourishment site supports commercial and residential development and does not provide significant wildlife habitat. It is our understanding there may be eelgrass beds offshore of the beach nourishment site, but not at the dredging site. It is likely that wildlife use of the inner harbor is affected by the high level of boating activity in the area, particularly during the summer months.

We would not expect dredging impacts to be significant since the material is coarse (sand and gravel) and would be removed hydraulically. Dredging should be scheduled to avoid the winter flounder spawning period of February through early June to minimize impacts to this important species. Eelgrass beds offshore of the disposal site should not be affected since the dredged material would be confined to the upper beach above the mean low water level. If the benthic sampling indicates that either the dredge or disposal sites support significant benthic resources, we request that there be additional coordination with us to discuss less damaging alternatives.

We appreciate the opportunity to comment on your proposed navigation improvement project. Please contact Mike Tehan at (603) 225-1411 if you have any questions or comments.

Sincerely yours,

Gordon E. Beckett

Gordon E. Beckett
Supervisor
New England Area

Massachusetts Natural Heritage Program

1 May 1989

Joseph L. Ignazio
Corps of Engineers
Planning Division
Impact Analysis Branch
424 Trapelo Road
Waltham, MA 02254-9149

Re: Provincetown Harbor Channel
Provincetown

Dear Mr. Ignazio:

Thank you for contacting the Natural Heritage and Endangered Species Program regarding rare species and ecologically significant natural communities in the vicinity of Provincetown Harbor in Provincetown, as described in your 14 April 1989 inquiry.

At this time, we are not aware of any rare plants or animals or natural communities in the area of the proposed site.

If your project plans change, or if additional fieldwork and research results in an update of our data base, this evaluation may require reconsideration.

Thank you, again, for consulting with us on this project. We greatly appreciate the opportunity to provide our input on projects being reviewed by the Corps.

Sincerely,

Jay Copeland
Environmental Reviewer

JC/jc

cc: town file, chrono file

ECONOMIC ANALYSIS

APPENDIX 1

APPENDIX 1
ECONOMIC ANALYSIS

DETAILED PROJECT REPORT

PROVINCETOWN HARBOR
PROVINCETOWN, MASSACHUSETTS

DECEMBER, 1989

APPENDIX 1
ECONOMIC ANALYSIS

Table of Contents

Tables and Maps

PROVINCETOWN

PILGRIM MONUMENT

COMMERCIAL STREET

McMILLAN WHARF

FISHERMAN'S WHARF

C 1977

600's DISPOSAL AREA (Typical section on PLATE 2-3)

RECOMMENDED

250' WIDE BY 13' DEEP CHANNEL RECOMMENDED

300' CHANNEL (not recommended)

EXISTING ℄ BREAKWATER

800' BREAKWATER (not recommended)

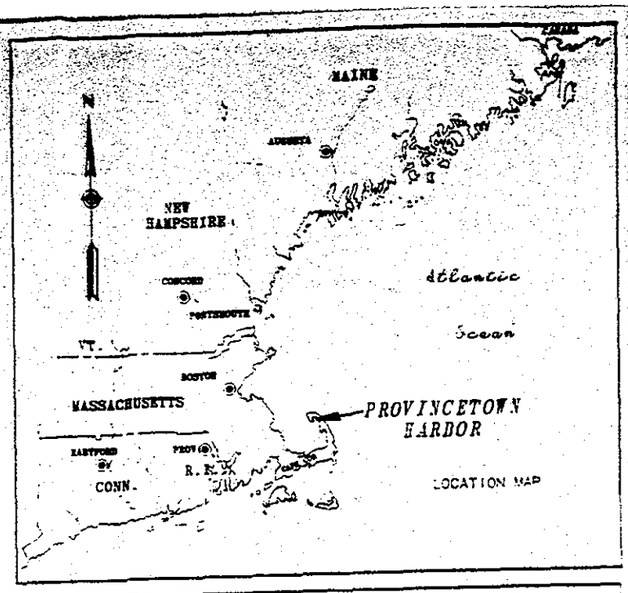
32+00 BKW

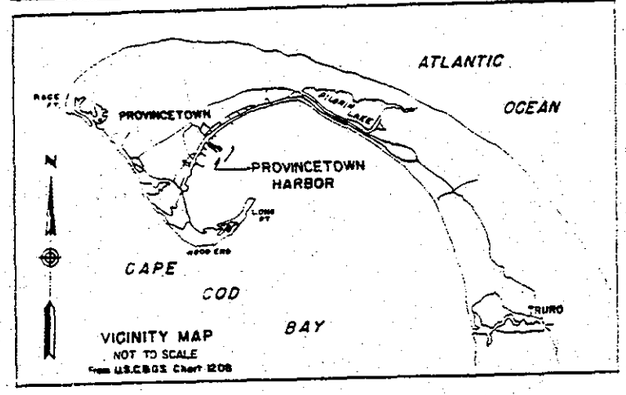
28+50 BKW

8+01.2 BKW

N 386000
N 385000
N 384000
N 383000
N 382000
N 387000

E 857000
E 858000
E 859000
E 860000





NOTES:

Coordinates are based on the Lambert Grid System for the Commonwealth of Massachusetts.

General Notes are on PLATE 2-2.

SAFETY PAYS

1"=200'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

PROVINCETOWN HARBOR, MASS.
NAVIGATION IMPROVEMENT STUDY
GENERAL PLAN

APPROVED

DATE

SCALE 1"=200' | SPEC. NO. DACW 33

MAP 1

Methodology

The purpose of this study is to identify and evaluate the economic benefits of establishing a federal channel and constructing a breakwater in Provincetown Harbor, Provincetown, MA. The location of the harbor and the proposed project is shown in Map 1. The federal channel is proposed for the area between the end of the town pier and the existing breakwater, to the southwest end of the breakwater. The breakwater is proposed for the area southwest of the existing breakwater, to provide protection to vessels in the harbor from southwest winds.

All benefits and costs are stated in their December, 1988 prices, and are converted to their present value equivalent based on the federal interest rate of 8 7/8%, using a project life of 50 years. Information used in this analysis was obtained from primary sources in Provincetown, including Provincetown fishermen, the harbormaster, town officials, and a private pier owner. A commercial fishing survey was distributed to approximately thirty-five Provincetown fishermen in August, 1988, of which six were filled out and returned to the Corps. In order to supplement this written survey, a telephone survey of fishermen identified by the harbormaster as having problems with the depth in the harbor was conducted.

Economic Setting

The economic study area consists of Provincetown Harbor in Provincetown, MA. Provincetown Harbor is a harbor of significant recreational, commercial, and historic importance. Provincetown is located at the tip of Cape Cod, as shown in Map 1. In the 1800's, Provincetown was one of the greatest and busiest sea ports in the country. Today Provincetown, although it has lost the position of grandeur it had in the 1800's, remains an important fishing port, with its prime location close to the fishing grounds of Georges Bank, . Total Provincetown fish landings in 1987 (excluding lobsters and clams) totalled 11.7 million pounds with a dollar value of $3.8 million. This ranks Provincetown in the top ten New England fishing ports in terms of both poundage and dollar value of landings. Although today tourism has overtaken fishing as Provincetown's primary industry, fishing is the second most important industry to the Provincetown economy, and fishing remains of primary importance to the town's winter economy.

Tourists are drawn both to the urban area of Provincetown, with its abundance of artist's boutiques, fine dining, and active night life, and to the rural lands of Provincetown which are part of the Cape Cod National Sea Shore. In 1980, Provincetown had a year-round population of 3,536, and a median family income of $13,347. In the summer, the population of Provincetown swells to an estimated four times its year-round population as tourists, vacationers, tourism-related businesses and their employees enter the town. In the 1980's, Provincetown has suffered from a high unemployment rate, especially in winter, emphasizing to the town the importance of its fishing industry. The average annual unemployment rate in

Provincetown since 1980 is shown below:

year	avg. annual unemployment rate
1980	21.8%
1981	23.7%
1982	26.8%
1983	24.0%
1984	17.3%
1985	13.1%
1986	12.3%
1987	20.7%
1988	19.2%

Unemployment in Provincetown in January, 1988 was 18.1% (not seasonally adjusted) which compares to a Massachusetts January, 1988 rate of 3.8%. However, unemployment in Provincetown in July, 1988 was only 3.4%, with a Massachusetts rate of 3.6%, showing the very seasonal nature of the Provincetown economy.

Provincetown harbor contains a large private pier, a town pier known as "MacMillan's Wharf", a coast guard pier, a Corps breakwater, and protected anchorage areas. The private pier and the majority of anchorage area in the harbor service the recreational fleet. The town pier services the the commercial fishing fleet almost exclusively, although a few party/tour boats also berth at the town pier. Two fish wholesalers operate on the town pier. Fish is off-loaded on the wharf and shipped to New Bedford and Boston for processing. There is no fish processing in Provincetown itself. Several local restaurants come to the pier with their own trucks and purchase fish directly from the fishermen.

Total yearly fish catch landed in Provincetown in both poundage and dollar value has been declining since 1980, and the 1987 figures represent a twenty-one year low for Provincetown fish catch. However, the town and the state are definitely committed to preserving and stimulating the Provincetown fishing industry, since fishing is well-recognized as critical to Provincetown's economic health. The town's commitment to the fishing industry is shown by the town funding of recent pier and harbor improvements which benefit almost exclusively the Provincetown fishing industry. In the 1980's, the town has contributed over one million dollars to plan, design, and construct pier and harbor improvements. These improvements have included rebuilding the length of the town pier, construction of finger piers off the town pier, and dredging around the piers. State and federal agencies have also contributed funding for these improvements, with their support totalling more than two million dollars. In addition to these recently completed improvements, there are currently plans for additional pier and harbor improvements, including rebuilding the T-section of the pier, adding an off-loading pier, and providing additional turning area, showing the solid commitment of the town and state to supporting and promoting the Provincetown fishing industry.

Vessels in the Harbor

There are 428 registered vessels in the harbor, of which 42 are commercial fishing boats, 10 are party/tour boats, and the remaining 376 are recreational boats. The recreational vessels are all either moored in the anchorage areas or tied up at the private marina. Of the 42 commercial fishing boats, 32 are draggers and 10 are lobster boats. The 10 lobster boats moor in the anchorage area. The 32 draggers tie up at the town pier, most at the new finger piers and several on the T-section of the pier. The profile of the 32 vessel dragger fleet is as follows:

Length	% of Dragger Fleet
40'-50'	13%
50'-60'	56%
60'-70'	25%
70'-80'	6%

In addition to the Provincetown recreational and commercial vessels, at times there are many other vessels in Provincetown harbor. Numerous transient fishing vessels come to Provincetown to off-load fish, vessels from home ports such as New Bedford, Gloucester, Boston, Woods Hole, and Nantucket. The number of transient fishing vessels in the harbor on any given day varies greatly, ranging from 0 to 25. The coast guard has two 40 to 45 foot vessels which tie up at the coast guard in the western section of the harbor, well removed from the town pier and the private pier.The BayState Steamship Company, located in Boston, MA, operates a passenger ferry that runs daily between Boston and Provincetown from May to October. The ferry is 190 feet in length with a draft of approximately 9 feet. Large luxury tour vessels visit Provincetown in the summer, bringing tourists from New York and other eastern seaboard cities.

Existing Conditions

The harbor is currently well protected from south and southeasterly winds by the existing breakwater. According to the Harbormaster, there are no significant problems in the harbor from overcrowding or congestion.

There is a problem in the harbor with sand shoaling on the west end of the breakwater, along the route most boats use to enter and exit the harbor. Depths along the entire travel route currently range from ten to seventeen feet, sufficient depth for the recreational fleet and for most of the commercial fleet. However, there are eleven draggers which have problems in the areas where the depth is only ten feet. These problems include tidal delays and grounding and dragging damages. The grounding and dragging damages consist primarily of damages to propellers and rudders. Fishermen of the larger Provincetown vessels reported dragging damages when the propeller drags along the harbor bottom and picks up trash items laying on the bottom such as cables and nets. The fishermen must then pay divers to clean off the trash caught in the propellor,

increasing their operating expenses. Fishermen also reported grounding damages to rudders. When stuck in the mud at low tide, rudders have been twisted and damaged. Based on this and other data provided by the fishermen, it is estimated in this analysis that on average three commercial fishing vessels per year experience grounding or dragging damages of $3,500 per vessel per year due to insufficient depth in the channel area.

Tidal delays caused by insufficient channel depth occur when the largest Provincetown vessels wait to enter or exit the harbor at low tide to avoid damage. Based on information provided by the fishermen in the surveys, the tidal delays occur to the eleven largest Provincetown fishing vessels 4 to 5 times per month and last from 1 to 1.5 hours per delay, depending on the size of boat. The vessels having problems with depth in the harbor are the largest commercial fishing vessels in the harbor, and have drafts ranging from 9 to 13 feet. Complete draft data was not available, but based on draft data provided by the fishermen in the surveys and the harbormaster, it is estimated that of the 11 boats, 7 have drafts between 9 and 10 feet, 3 have drafts of 11 feet, and 1 has a draft of 13 feet.

Also a problem in the harbor is the lack of protection from southwest winds. There is currently a court order restricting the use of MacMillan Wharf when the southwest winds exceed 30 mph because of structural problems. When the southwest winds exceed 30 mph, any draggers tied up at the T-section of the pier must be moved off the pier. The boats are moved to the southwestern section of the harbor near Long Point, slightly over 1 mile from MacMillan Wharf. It was estimated by the Harbormaster that, on average, it is necessary for eight boats to be moved from the T-section of the pier eight times per year, and that approximately 5.5 hours are spent per incident, .5 hour moving the boats and 5 hours waiting with the boats for the winds and waves to subside.

The southwest winds and waves also cause problems to the Provincetown commercial fishing fleet in the form of chaffing and rail damages and off-loading delays. Damages occur to the vessels while off-loading at the pier or while tied up at the pier, the winds and waves causing boats to bang against the pier. Boats tied up at the T-section of the pier are most likely to be damaged since the pier itself acts as a partial breakwater to vessels at the finger piers. Even with the court restriction to move vessels at the T-section of the pier when southwest winds exceed 30 mph, these vessels still risk damage, as these fishermen are not always available to move their boats in time to prevent damage. Based on information provided by the fishermen in the commercial fishing surveys and information provided by the Harbormaster, it is estimated in this analysis that damages to commercial fishing vessels caused by southwest winds are experienced by, on average, fifteen of the thirty-two draggers per year. Based on information provided by fishermen in the commercial fishing survey, it is estimated that 8 of the 10 Provincetown draggers with lengths greater than 60 feet experience damages from southwest winds of $3,000 per boat per year, and that 7 of the 22 draggers with lengths less than 60 feet experience damages of $1,500 per boat per year.

Off-loading delays caused by southwest winds occur when, in order to avoid damage to the boats, the vessels wait to off-load until the winds subside. Also based on information provided by fishermen and the harbormaster, it is estimated in this analysis that off-loading delays caused by southwest winds occur twenty-four times a year, affect six fishing vessels per incident, and last an average of three hours each delay.

Southwest winds also cause problems to the Provincetown recreational fleet. These problems include boats breaking free of moorings, chaffing and banging damages, collision damages when a boat is off its mooring, and general inconveniences. Based on estimates of the private pier owner where the recreational fleet is based, this analysis assumes that, on average, three recreational vessels incur damage costs of $10,000 per vessel per year from problems caused by southwest winds.

Without Project Condition

It is unlikely local interests will provide either a channel or a breakwater to Provincetown Harbor. Without the channel, the larger draggers will continue to experience tidal delays and grounding damages. Without the breakwater, boats will continue to be moved from the T-section of the town pier when southwest winds are strong, causing the Provincetown fishermen to incur fuel and labor time costs. Boats will continue to experience damages from banging against the pier in southwest winds, and fishermen will continue to experience off-loading delays and their associated costs when the southwest winds are too strong to off-load safely.

With Project Condition

The with project condition includes the establishment and dredging of a 250 foot wide federal channel and the construction of a 800 foot breakwater. The proposed breakwater would reduce southwest waves from their current 6 feet in worst weather to approximately 2 feet with the breakwater. Based on discussions with local officials, this analysis assumes that reducing the wave height to two feet would eliminate all the damages and off-loading delays currently caused by southwest winds.

Benefits attributable to the federal channel include labor time savings and fuel cost savings by eliminating tidal delays, and elimination of grounding and dragging damages. Benefits attributable to the breakwater include elimination of damages to commercial fishing vessels, labor time and fuel cost savings by eliminating off-loading delays, labor time and fuel cost savings by eliminating the need to move boats from the T-section of the pier, and prevention of damages to recreational vessels.

Labor time savings of the fishermen are calculated using the September, 1988 average hourly wage of $10.38 of a Massachusetts production worker in manufacturing. The benefits are calculated based on information provided by the harbormaster, town officials,

the private pier owner, the results of 6 written commercial fishing surveys received, and the results of a telephone survey of the 11 fishermen identified by the harbormaster as having problems with depth in the harbor.

Corps guidance require that separable elements of a project be individually justified on economic terms. Since the channel and breakwater are each separable elements, the benefits for each are calculated separately.

Calculation of Channel Benefits

Benefits attributable to establishing a federal channel in Provincetown Harbor include labor time and fuel savings by eliminating tidal delays, and prevention of grounding and dragging damages. The following channel depths are examined in order to identify the depth which yields the highest net benefits: 12 ft. mlw, 13 ft mlw, 14 ft. mlw, and 15 ft. mlw. In order to allocate benefits to each channel depth, the eleven draggers known to be having problems with depth are divided into three groups:

Class A: draggers with draft of 9'-10' - 7 vessels
Class B: draggers with draft of 11' - 3 vessels
Class C: draggers with draft of 13' - 1 vessel

From data obtained directly from Provincetown fishermen identified by the harbormaster as having problems with depth, draggers in each class have tidal delays of the following frequency and duration, yielding the total delay hours per boat per year as follows:

class	# delays per month		# months per year		length of avg delay		delay hours per boat per year
A	4	X	12	X	1 hour	=	48 hrs/yr
B	4	X	12	X	1.5 hours	=	72 hrs/yr
C	5	X	12	X	1.5 hours	=	90 hrs/yr

Eliminating these delays yields benefits in both saved fuel costs and saved labor costs. Dollar value for saved fuel costs equals: the number of boats experiencing delays; times the number of delays hours per boat per year for that class of boat; times vessel fuel consumption per hour; times the price per gallon of fuel. Annual dollar value for saved fuel costs by class of boat equals:

class	# boats in class		delay hours per boat per year		fuel consumed per hour		$ per gallon	annual dollar value
A	7	X	48	X	6 gal	X	$1.00	= $2,016
B	3	X	72	X	6 gal	X	$1.00	= $1,296
C	1	X	90	X	6 gal	X	$1.00	= $ 540

Dollar value for saved labor costs equals: the number of boats experiencing delays; times the number of delays hours per boat per year for that class of boat; times the number of crewmen per boat; times the Massachusetts wage for a production worker in manufacturing. Annual dollar value for saved labor costs by class of boat equals:

class	# boats in class		delay hours per boat per year		number crewmen per boat		$ wage per hour	annual dollar value
A	7	X	48	X	4	X	$10.38	= $13,951
B	3	X	72	X	4	X	$10.38	= $ 8,968
C	1	X	90	X	4	X	$10.38	= $ 3,737

Total annual benefit for the elimination of tidal delays equals: the dollar value of the fuel costs saved; plus the dollar value of the labor costs saved, as shown below in Table 1:

Table 1
Tidal Delay Costs Saved

class	fuel costs saved		labor costs saved		total costs saved
A	$ 2,016	+	$13,951	=	$15,967
B	$ 1,296	+	$ 8,968	=	$10,264
C	$ 540	+	$ 3,737	=	$ 4,277

Based on data obtained from Provincetown fishermen, each class of boat incurs grounding and dragging damages of the frequency and dollar value shown in Table 2:

Table 2
Grounding and Dragging Damages

class	avg # boats damaged per year		avg $ damage per boat		annual damage per boat class
A	2	X	$2,000 per boat	=	$4,000
B	1	X	$3,500 per boat	=	$3,500
C	1	X	$3,500 per boat	=	$3,500

Benefits to each channel depth examined accrue to each class of boat in relation to the boat depths. Class A boats, with drafts of 9'-10' experience full benefits with the 12' channel, which allows for pitch, squat, and roll, and general safe clearance. Class B boats, with drafts of 11', experience full benefits with the 13' channel. Class C boats, with drafts of 13', experience full benefits with the 15' channel. Class B and C boats experience partial benefits, but not full benefits, at the channel depths below the channel depth at which they experience full benefits. For the purpose of this analysis, it is estimated that benefits will be experienced by each class of boat at each channel depth in the percentages shown in Table 3:

Table 3
Channel Benefit Percentages

class	12'mlw	13'mlw	14'mlw	15'mlw
Delays:				
A	100%	100%	100%	100%
B	50%	100%	100%	100%
C	10%	25%	75%	100%
Damages:				
A	100%	100%	100%	100%
B	50%	100%	100%	100%
C	-	-	50%	100%

Annual benefits for the the reduction of tidal delays for each class of boat at each channel depth equal the percentages in the Table 3 multiplied by the dollar value for the corresponding boat class in Table 1. Annual benefits for the the reduction of grounding and dragging damages for each class of boat at each channel depth equal the percentages in the Table 3 multiplied by the dollar value for the corresponding boat class in Table 2. The result of these calculations is shown below in Table 4. The annual benefits for each class of boat at each channel depth are shown. Total annual benefits for each channel depth alternative examined equal the sum of the respective column, as shown.

Table 4
Total Annual Channel Benefits

class		12'mlw	13'mlw	14'mlw	15'mlw
Delays:					
	A	$15,967	$15,967	$15,967	$15,967
	B	5,132	10,264	10,264	10,264
	C	428	1,069	3,208	4,277
Damages:					
	A	$ 4,000	$ 4,000	$ 4,000	$ 4,000
	B	1,750	3,500	3,500	3,500
	C	-	-	1,750	3,500
TOTAL ANNUAL CHANNEL BENEFITS:		$27,277	$34,800	$38,689	$41,508

Calculation of Breakwater Benefits

Benefits attributable to constructing a breakwater include the prevention of damages caused by southwest winds to commercial and recreational vessels, labor time and fuel savings by eliminating off-loading delays caused by southwest winds, and labor time and fuel savings by eliminating the need to move boats from the T-section of the pier.

The annual benefit for the prevention of damages caused by southwest winds to commercial vessels equals: the number of boats > 60' damaged (8) times the yearly damage ($3,000); plus the number of boats < 60' damaged (7) times the yearly damage ($1,500); or $34,500.

(8 boats X $3,000) + (7 boats X $1,500) = $34,500.

The annual benefit for the prevention of damages caused by southwest winds to recreational vessels is based on information provided by the private pier owner and the harbormaster. It is estimated that, on average, without the project each year 3 recreational boats will incur damages due to the southwest winds of $10,000 per boat. With the project, these damages will be prevented, for an annual benefit of $30,000.

3 boats X $10,000/boat = $30,000

The annual benefit to the breakwater in labor time savings by eliminating off-loading delays caused by southwest winds equals: the approximate number of times a year off-loading delays occur (24); times the average number of boats affected per delay (6); times the length of the average delay (3 hours); times the number of crewmen per boat (4); times the hourly wage for a Massachusetts production worker in manufacturing ($10.38); or $17,937.

24 delays X 6 boats X 3 hours X 4 men/boat X $10.38 = $17,937

The annual benefit to the breakwater in fuel cost savings by eliminating off-loading delays equals: the number of off-loading delays per year (24); times the number of boats affected per delay (6); times the length of the average delay (3 hours); times fuel consumption per hour (6 gallons/hour); times the price of diesel fuel ($1.00); or $2,592.

24 delays X 6 boats X 3 hours X 6 gallons/hr X $1.00 = $2,592

The proposed breakwater will make moving the boats from the pier when SW winds exceed 30 mph unnecessary, yielding labor time savings and fuel cost savings. The annual benefit of the labor time savings, based on information provided by the Provincetown Harbormaster, equals: the number of boats which need to be moved per incident (8); times the estimated number of times a year the SW winds exceed 30 m.p.h. (8); times the number of hours spent moving the boats and waiting at Long Point (5.5 hours); times the average number of crewmen per boat (4); times the hourly wage for a Massachusetts production worker in manufacturing ($10.38); or $14,615.

8 boats X 8 incidents X 5.5 hours X 4 men/boat X $10.38 = $14,615

The fuel cost savings by eliminating the need to move the boats equals: the number of boats which need to be moved per incident (8); times the number of times per year the SW winds exceed 30 m.p.h. (8); times the number of hours engine is in use per incident (0.5 hour); times the fuel consumption per hour (6 gallons per hour); times the price of diesel fuel ($1.00 per gallon); or $192.

8 boats X 8 incidents X 0.5 hour X 6 gallons/hr X $1.00 = $192

Total annual benefits attributable to constructing a breakwater equal the sum of the above breakwater benefits:

$34,500 + $30,000 + $17,937 + $2,592 + $14,615 + $192 = $99,836

TOTAL ANNUAL BREAKWATER BENEFITS = $99,836

Other Benefit Categories Examined

Based on discussions with Provincetown ferry officials, it was determined that the ferry would not benefit significantly from either the proposed federal channel or the proposed breakwater. According to ferry officials, the harbor is currently of sufficient depth for the ferry, and the southwest winds cause only minor inconveniences, no actual damages, to the ferry.

No benefits are taken for the prevention of fish spoilage during off-loading delays or tidal delays since the draggers have ice on board, preventing fish spoilage. Benefits attributable to the breakwater for reduced maintenance costs to the town pier were examined. However, there was not sufficient information available to quantify those benefits.

Benefits for a doubling in the size of the Provincetown fishing fleet which were taken in the 1979 Reconnaissance study are not taken in this analysis. The size of the Provincetown fishing fleet has actually declined since 1979.

The planned expansion of the private marina immediately west of the existing private pier is not included in this analysis because the expansion was determined to be insignificant to the analysis. The expansion is to include slips for 270 recreational boats and a floating breakwater to protect the boats from southwest winds. Whether this expansion occurs or not is insignificant to this analysis for the following reasons: (1) the additional recreational boats will likely be of size similar to the recreational boats currently using the harbor which have no problem with depths in the harbor and thus the additional boats would not benefit significantly from a federal channel; and (2) the additional recreational boats would be protected from southwest winds by the floating breakwater included in the expansion plans and thus the additional boats would not benefit significantly from a federal breakwater.

Construction Costs

Annual construction costs for each alternative examined are calculated from the total first construction costs and the expected annual operation and maintenance costs. Total first costs are annualized based on a federal interest rate of 8 7/8% and a project life of 50 years. Total first costs, annualized first costs, operation and maintenance costs, and total annual costs for each project alternative examined are shown in Table 5. Detail on construction costs is contained in the engineering appendix.

Table 5
Construction Costs
(in $1000's)

Alternative	Total First Cost	Annualized First Cost	Annual O&M Costs	Total Annual Costs
250' wide channel				
12' mlw	$254	$23	$ 3.5	$26.5
13' mlw	$283	$25	$ 5.5	$30.5
14' mlw	$332	$30	$ 9.0	$39.0
15' mlw	$365	$33	$12.0	$45.0
800' Rubble Mound Breakwater	$1,950	$176	$ 5.0	$181.0

Economic Summary and Conclusions

In order for a proposed project to be considered economically justified, the project must have a benefit-cost ratio equal to 1.0 or greater. When an improvement plan is composed of two or more independent parts, each part must be analyzed separately to determine if it meets the test of economic justification solely on its own benefits and costs. To fulfill this requirement, the benefit-cost ratios of each channel alternative and of the proposed breakwater are evaluated separately.

The total annual benefits, total annual costs, benefit-cost ratios, and net annual benefits of each examined alternative are shown below in Table 6.

Table 6
Economic Summary
(in $1000's)

Alternative	Annual Benefits	Annual Costs	Benefit-Cost Ratio	Net Annual Benefits
12' mlw, 250' wide channel	$27.3	$ 26.5	1.0	$ 0.8
13' mlw, 250' wide channel	$34.8	$ 30.5	1.1	$ 4.3
14' mlw, 250' wide channel	$38.7	$ 39.0	0.99	negative
15' mlw, 250' wide channel	$41.5	$ 45.0	0.9	negative
800' Rubble Mound Breakwater	$99.8	$181.0	0.6	negative

Table 6, above, shows that all the 12' and 13' channel alternatives have positive benefit-cost ratios and thus these two channel alternatives are economically justified. The 14' and 15' channel alternatives and the breakwater alternative have negative benefit-cost ratios and thus these alternatives are not economically justified. According to Corps guidelines, the National Economic Development (NED) plan is the economically justified plan which maximizes net annual benefits. Of the two economically feasible channel alternatives, the recommended NED plan for Provincetown Harbor is the 13' mlw, 250' wide channel which has the highest net annual benefits of $4,300.

ENGINEERING INVESTIGATIONS
DESIGN & COST ESTIMATES

APPENDIX 2

Provincetown Harbor

Appendix 2

Engineering Investigations, Design and Cost Estimates

January 1990

Provincetown Harbor
Appendix 2
Engineering Investigations, Design & Cost Estimates

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Existing Conditions

1. Description of Project Area:

The community of Provincetown, Massachusetts is located on the northernmost tip of Cape Cod. Provincetown Harbor faces southeast toward Cape Cod Bay. Most of the commercial and recreational navigation activity in the harbor centers around two piers. MacMillan Wharf is a municipal wharf that serves as home port to the commercial fishing fleet, as well as being utilized by several "Whale Watch" vessels and a large ferry operating out of Boston. Fisherman's Wharf, to the west, is a privately owned pier which primarily serves recreational craft, especially during the summer months when the number of recreational vessels increases significantly.

There are two existing Federal projects in Provincetown. The first provides for a 2,500 foot long breakwater to protect the harbor against waves approaching from the east-northeast clockwise through the south-southeast (see Plate 2-1). The second is a dike that crosses the House Point Island Flats and connects the western end of Provincetown with Wood End and Long Point to the south. This structure stabilizes the barrier beach across the flats, which in turn protects against waves developed in Massachusetts Bay that would cross the flats and enter the harbor from the west-southwest.

Presently a number of vessels moor in the "assumed" channel in the lee of the breakwater. This causes difficulties for boats navigating to and from the previously mentioned piers. In addition, some shoaling has occurred just north of the western end of the breakwater, which causes navigation difficulties for a few of the deeper draft vessels during low tide conditions. These factors have contributed to a local interest in establishing a Federal access channel for the harbor.

Locally generated waves behind the existing breakwater approach both piers from the southwest. These waves cause difficulties in off-loading fish at MacMillan Wharf and force vessels tied alongside either pier to bang into the pier, thereby damaging both piers and boats. The local sponsor has also expressed an interest in constructing another breakwater to protect both piers and boats from these southwesterly waves.

2. Field Investigations:

a. Hydrographic Surveys: A hydrographic condition survey of the project area was conducted by New England Division (NED) personnel in October 1988. When this survey was compared with a previous survey of 1981, it was found that most of the study area has a very low shoaling rate. The results of the 1988 survey are shown on Plate 2-2 of this appendix.

b. Subsurface Investigations: Tube and grab samples were taken by NED personnel to determine the characteristics and distribution of the soil materials within both the proposed dredging area and the disposal site. A total of seven grab samples and one tube sample (Figure 2-1) was obtained

and analyzed at the NED Laboratory. In general, the top strata within Provincetown Harbor consists of clean sand and is void of any rock or ledge. This was confirmed by the test results as shown on Figures 2-2 through 2-7 of this appendix.

c. Sediment Analysis: Soil samples were visually classified in the field and verified in the laboratory using the Unified Soils Classification System (USCS). Physical testing was conducted on all samples and consisted of mechanical sieve analysis (using U.S. standard sieve sizes), specific gravity tests and hydrometer analysis wherever necessary. Grain size distribution curves and material descriptions for each of the samples are shown on Figures 2-2 through 2-11. Samples were analyzed from both the proposed dredge area and the proposed disposal site on the beach. All of the samples tested were found to contain poorly graded sands, devoid of fines and containing a minimum fraction of gravel. Sample locations are shown on Figure 2-1. This data confirms that any material dredged from the harbor would be compatible with the existing beach sand and suitable for nourishment of the beaches adjacent to the project site.

Plans of Improvement

1. Alternative A, 250' Wide Access Channel.

a. Design Conditions: Existing bottom depths in the harbor range from 10 to 17 feet below Mean Low Water (MLW). Most of the present commercial fishing fleet require from 10 to 12 feet of water to operate safely while fully loaded, although there are a few vessels that have drafts up to 13.5 feet when loaded. Using these drafts in combination with the affects of squat, pitch and roll and adding an underkeel clearance of 0.5 feet gives a required channel depth of about 13 feet for the more common vessels using the harbor, and 15 feet for the larger vessels. Because of the variety of vessels using the harbor and their associated channel depth requirements, this alternative channel width was analyzed for depths of 12, 13, 14 and 15 feet below MLW.

b. Channel Dimensions: This proposed channel alternative was designed for safe, two-way navigation of boats to and from both piers as well as a proposed town anchorage just east of MacMillan Wharf. The proposed channel limits terminate in deep water just seaward of the existing breakwater. The channel was designed to allow passage of a "Whale Watch" boat with a 60' beam along with an average size fishing boat having a 20' beam. Using these two design vessels and the criteria in Engineering Manual (EM) 1110-2-1613, dated April 1983, a channel width of 220 feet was determined to be necessary for safe navigation under these conditions. However, there is a wider ferry which uses MacMillan Wharf to on-load and off-load passengers from Boston. This ferry has a beam of 90 feet with a 10 foot loaded draft. Using the criteria for one-way traffic presented in the above EM results in the need for a minimum channel width of 250 feet. As a result, it has been determined that a minimum channel width of 250' would be necessary to encompass all foreseeable future vessel traffic conditions. Because of the need for a sharp bend in the proposed channel, the channel was significantly widened to maintain safe navigation in that bend section (see Plate 2-1). Although this channel alternative is designed for two-way traffic under normal circumstances, it should be noted that when the ferry is present in the channel traffic will have to be limited to one direction.

c. Channel Alignment: The proposed channel alignment was designed for safe passage of vessels from the pier areas to naturally deep water (see Plate 2-1). The proposed channel is approximately perpendicular to both piers and parallel to the existing breakwater. The shoreward limit of the channel was established at a distance of 100 feet from MacMillan Wharf to allow for berthing of the Boston ferry (90' beam). The proposed channel terminates approximately 320' east of MacMillan Wharf to allow for access to the two finger piers and a proposed town anchorage east of the wharf. It should be noted that the proposed channel in conjunction with the 100' wide berthing area at MacMillan Wharf provide a sufficient size turning basin for all vessel sizes presently using the facility (EM 1110-2-1613). The channel entrance is located to the west and just south of the existing breakwater.

d. Dredging: Two methods of dredging were considered for this project. The first involved the use of a mechanical dredge and two dump scows to haul the dredged material 37 miles to the Foul Area Disposal Site located in Massachusetts Bay. Because of the long haul distance to the disposal site, dredging by mechanical means was found to be very costly, in the order of about $12/cubic yard. Also, because the material to be dredged is very suitable for beach nourishment, it was not considered to be in the best public interest to dispose of it at an open ocean disposal site rather than on a beach. These factors excluded the use of a mechanical dredge from further considerations.

The second method evaluated was to pump the material onto a nearby beach using a hydraulic dredge. The availability of a nearby disposal area makes hydraulic dredging a very cost effective method. In addition, the material placed on the shore will provide additional recreational beach area and afford protection against erosion and flooding of the backshore. In light of these factors, the use of a hydraulic cutterhead dredge is considered to be the most efficient and economical dredging method. In order to accomplish the necessary dredging for this alternative, a typical hydraulic dredging plant consisting of the following equipment would be necessary: a 16 inch hydraulic dredge, 3,000 feet of pipeline, a 1,200 HP tugboat, a derrick barge, a 165 HP launch, and a front end wheeled loader for shaping the beach.

Two potential beach disposal sites were analyzed for this project. One is located approximately 1.3 miles east of the project site and would require the use of a booster pump to adequately move the material over such a long distance. Because of the substantial costs associated with a booster pump and no significant economic or environmental benefits to be gained from its use, this disposal site was dropped from consideration. The other site evaluated is located just west of Fisherman's Wharf and approximately 2,000 feet from the dredge zone. A maximum length of 600 feet of beach would be required to dispose of all the dredged material associated with this alternative (see Plate 2-3). Analysis of historical data has shown the annual net direction of sediment transport in this area to be westward, away from the project site. As a result, this is considered to be the optimum disposal site for all dredging alternatives.

e. Material Quantities: The material to be dredged is a poorly graded sand which is devoid of fines making it very suitable for beach nourishment and an excellent material for pumping with a hydraulic dredge. Quantities of

material to be dredged for the four optional depths considered for this alternative are found in Table 2-1. To allow for construction inaccuracies, one foot of overdepth dredging is allowed (see Plate 2-2) and those quantities are included in Table 2-1. Dredging quantities were computed using a typical trapezoidal cross-section with 1 on 3 side slopes as shown on Plate 2-2 and from the hydrographic survey of 1988.

Table 2-1

Dredging Quantities - Alternative A

Project Depth (MLW)	Total Cubic Yards To Be Removed
-12'	10,000
-13'	19,500
-14'	32,900
-15'	46,200

f. Cost Estimates: Construction cost estimates were prepared for all four optional project depths associated with this alternative. All cost estimates were computed using 1988 price levels and include contractor markup, Planning, Engineering & Design (PE&D) costs, Construction Management (CM) costs, and contractor mobilization and demobilization. Because a 13 foot channel depth below MLW is considered to be the optimal design (see Economics Appenix), costs for that option were broken down and are shown in Table 2-2. This table also provides costs for the other three optional project depths.

Table 2-2

First Cost of Federal Improvement - Alternative A

Dredging of a 250 foot wide access channel to a depth of 13 feet below MLW.

Dredging

Ordinary Material	19,500 cy @ $9.50 cy =	$185,250
Contingencies 20%		37,050
Subtotal		222,300
Planning, Engineering & Design		33,200
Construction Management		27,000
First Construction Cost		$282,500

Notes: It is estimated that it will take approximately two weeks to complete this work.

First Construction Cost for the 12, 14, and 15 foot depths are $253,500, $331,500, and $364,500, respectively.

2. Alternative B, 300' Wide Access Channel

a. Design Conditions: The same conditions apply to this alternative as to Alternative A. A 13 foot channel depth (below MLW) has been determined as the optimal design to accommodate existing and potential future vessels using the harbor. As with Alternative A, this alternative was analyzed for depths of 12, 13, 14 and 15 feet below MLW.

b. Channel Dimensions: This alternative proposes a Federal channel designed to accommodate two-way passage of the ferry having a 90' beam and an average fishing boat with a 20' beam. Using the criteria presented in EM 1110-2-1613, a channel width of 300 feet was determined to be necessary for safe navigation for the vessels under these conditions. This channel follows the same alignment as in Alternative A, terminating in deep water seaward of the existing breakwater and provides access to the berthing areas of both piers (see Plate 2-1).

c. Dredging: Because the site conditions for this alternative are identical to those for Alternative A, it was determined that the same hydraulic dredging plant should be used. The same disposal site will also be used (see Plate 2-3).

d. Material Quantities: Quantities of material to be removed, including overdepth, for the four optional depths of this alternative can be found in Table 2-3. Dredging quantities were computed using the hydrographic survey of 1988 and the typical cross-section shown on Plate 2-2.

Table 2-3

Dredging Quantities - Alternative B

Project Depth (MLW)	Total Cubic Yards To Be Removed
-12'	11,500
-13'	22,700
-14'	37,300
-15'	56,000

e. Cost Estimates: Construction cost estimates were prepared for all four optional project depths associated with this alternative. All cost estimates were computed using 1988 price levels and include contractor markup, PE&D costs, CM costs, and contractor mobilization and demobilization. For comparison purposes with Alternative A, Table 2-4 shows a cost breakdown for the 13' depth option. Costs for the other three optional depths are also provided.

Table 2-4

First Cost of Federal Improvement - Alternative B

Dredging of a 300 foot wide channel to a depth of 13 feet below MLW.

Dredging

Ordinary Material	22,700 cy @ $8.75 cy	=	$198,625
Contingencies 20%			39,725
Subtotal			238,350
Planning, Engineering & Design			33,150
Construction Management			28,000
First Construction Cost			$299,500

Notes: It is estimated that it will take approximately two weeks to complete this work.

First Construction Cost for the 12, 14, and 15 foot depths are $262,000, $346,000, and $400,000, respectively.

3. Alternative C, 800' Breakwater

a. Design Conditions: Both fishing and recreational vessels have sustained damages due to wave attack from the SSW and SW. Waves of up to 6-feet in height have been observed at both piers during severe storm conditions. However, the more frequently occurring 3-foot waves from the SSW cause much greater difficulties to fishermen unloading their catch.

Waves from the SSW are mainly generated by local winds but mixing does occur with deep water waves generated in Cape Cod Bay and diffracted around Long Point. For design purposes in this report, wave heights were developed using available wind data for various windspeeds and durations from the SSW direction. Hindcasting methods as presented in the Shore Protection Manual, 1984 (SPM) and the Automated Coastal Engineering Software (ACES) were used to develop a better understanding of the wave climate within the harbor. It was determined that a 35 mile per hour SSW wind with a duration of 2 hours would develop a 3.5 foot wave behind the existing breakwater. This type of wind occurs fairly frequently in the study area. For safe uninterrupted off-loading at either pier a maximum allowable wave height of 1.5 feet should not be exceeded.

b. Breakwater Design: The first step in designing a breakwater is to determine the design still-water level (SWL) and a corresponding design wave. It was decided to design the breakwater to protect the harbor against a SSW storm with a 10 percent probability of occurrence in any one year (this is commonly called a 10-year event). The 10-year SWL at Provincetown Harbor is about 12.5 feet above MLW. The maximum wave expected to occur under the 10-year storm conditions is a 6 foot significant wave with a 7 second period. This wave was developed using the SPM and ACES, and using a 55 mph windspeed with a 2 hour duration.

Using the design storm SWL and wave height, the dimensions and alignment of the breakwater can then be determined. Using the procedures in the SPM and designing to restrict the maximum allowable wave height to 1.5 feet at both piers, the following rubble mound breakwater dimensions were derived: breakwater crest at elevation 14.5' MLW, 1 on 2 side slopes, 8' crest width and a toe apron to protect against scouring. The breakwater was aligned approximately perpendicular to the direction of the incident design wave (SSW). Because of the direction of wave propagation and the reaction of waves diffracting around a structure, the proposed breakwater was positioned as close to the existing breakwater as possible without causing difficulties to navigation in the proposed channel. It was then determined (using methods prescribed in the SPM) that a minimum breakwater length of 800 feet would be required to reduce the design incident wave of 6 feet to an acceptable 1.5 foot wave at both piers. The proposed breakwater alignment is shown on Plate 2-1. This breakwater design would fully protect the two piers during the design storm conditions.

c. Cost Estimates: A construction cost estimate for the previously described breakwater was performed using 1988 price levels and includes contractor markup, PE&D costs, CM costs, and contractor mobilization and demobilization. This cost estimate is shown in Table 2-5.

Table 2-5

First Cost of Federal Improvement - Alternative C

Construction of an 800' breakwater, crest elevation 14.5' MLW

Armor Stone & Core Stone	47,900 Tons @ $30/ton	$1,437,000
Bedding Material	2,800 c.y. @ $20/cy	56,000
Contingencies 20%		298,600
Subtotal		$1,791,600
Planning Engineering & Design		48,400
Construction Management		110,000
First Construction Cost		$1,950,000

NOTES: Because the material quantity in the armor/core stone line item is primarily composed of core stone, the unit price for that line item is biased towards core stone.

It is estimated that this work will take approximately 9 months to complete.

4. Selected Plan

The selected plan, as determined through economic and environmental analysis, is Alternative A. This alternative would provide for the construction of a 250' wide by 13 foot deep (MLW) channel (see Plate 2-2) providing access to both piers and any future anchorages east of MacMillan Wharf. Dredging is to be performed by hydraulic dredge and the material disposed of on the beach just west of Fisherman's Wharf (see Plate 2-3).

Alternative C, is a separable element that could be authorized either with or without the navigation channel. However, it was not found to be economically justified and is not recommended for Federal participation at this time.

5. Aids to Navigation

Specific costs for aids to navigation will be obtained from the U.S. Coast Guard, who will be responsible for placing and maintaining any aids they deem necessary for boating safety. For the purpose of this report it is assumed that three steel can buoys will be needed at an initial cost of $4,000 per buoy. One will be needed to mark the entrance to the channel and the other two to mark the channel limits.

6. Maintenance

Maintenance of the navigation improvements proposed under each alternative would be necessary at periodic intervals throughout the 50-year project life. Maintenance of the channel to authorized dimensions would be necessary to ensure continued efficiency of the project.

After initial construction dredging, the channel can be expected to experience shoaling in some areas. This shoaling is attributable to settlement of side slope materials, deposition of material eroded from upland regions and redistribution of bottom materials by tidal currents. Analysis of historical hydrographic data has shown that Provincetown Harbor has a low shoaling rate. As a result, it is estimated that the annual shoaling will not exceed 2 percent of the total volume of material to be removed under the selected plan. This percentage converts to about 400 cubic yards per year. Maintenance dredging will be required when the channel depth decreases by 1 to 2 feet from the authorized depth. Based on the historic shoaling rate, maintenance dredging to maintain project depth and efficiency is only expected to be required every 15 to 20 years.

CORPS OF ENGINEERS

U. S. ARMY

A B C D E F G H

E 955000 E 956000 E 957000 E 958000 E 959000

N 386000 N 385000 N 384000 N 383000 N 382000

1 2 3 4 5 6 7 8

PROVINCETOWN

PILGRIM MONUMENT

STREET

COMMERCIAL

MACMILLAN WHARF

FISHERMAN'S WHARF

C 1977

600'± RECOMMENDED DISPOSAL AREA (Typical section on PLATE 2-3)

M.L.W.

300' CHANNEL (not recommended)

250' WIDE BY 13' DEEP CHANNEL RECOMMENDED

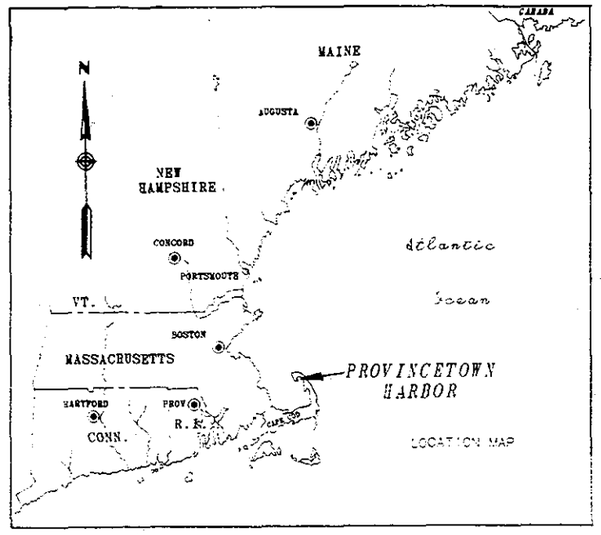
EXISTING ℄ BREAKWATER

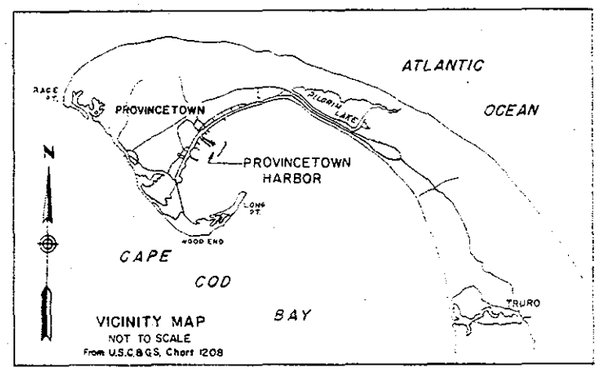
800' BREAKWATER (not recommended)

32+00 BKW.

28+50 BKW.

8+01.2 BKW.





NOTES:

Coordinates are based on the Lambert Grid System for the Commonwealth of Massachusetts.

General Notes are on PLATE 2-2.

SAFETY PAYS

GRAPHIC SCALES

200' 0 200' 400'

1"=200'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

PROVINCETOWN HARBOR, MASS.
NAVIGATION IMPROVEMENT STUDY
GENERAL PLAN

APPROVED DATE
CHIEF, ENGINEERING DIVISION

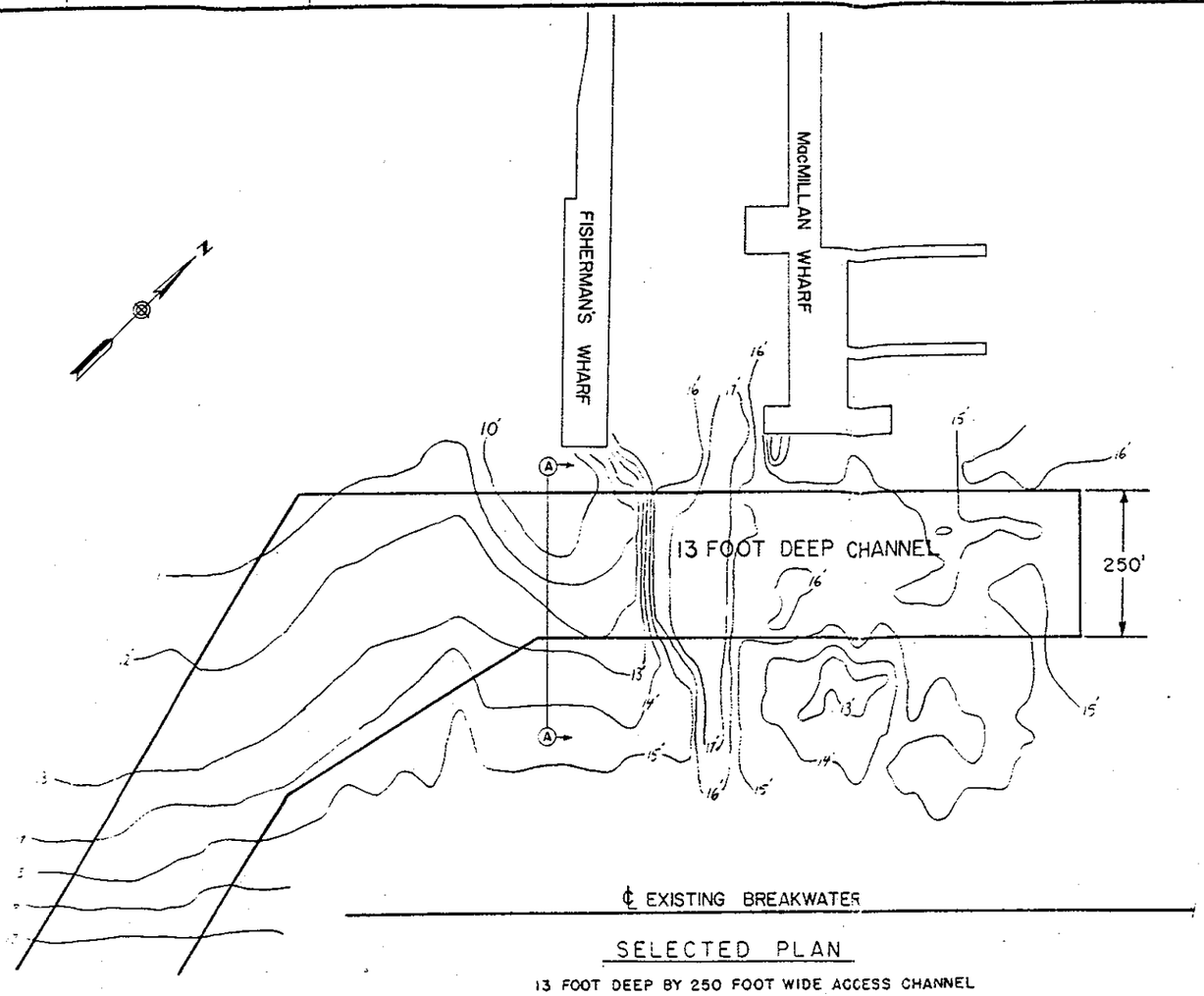
SCALE 1"=200' | SPEC. NO. DACW 33

PLATE 2-1

DRAWING NUMBER

SHEET

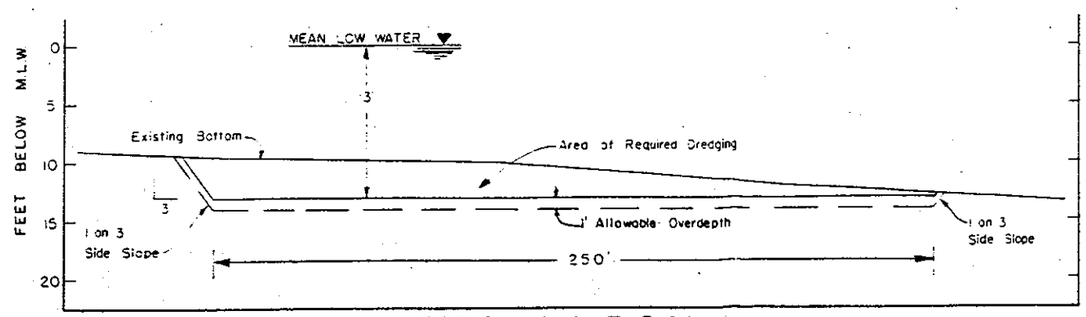
CORPS OF ENGINEERS — U. S ARMY



SELECTED PLAN

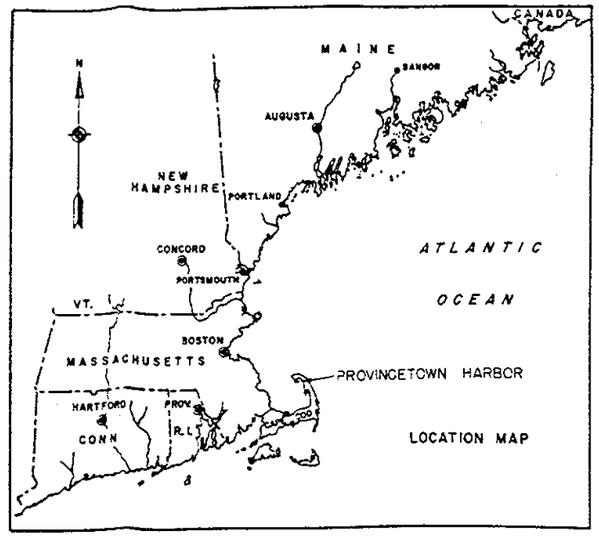
13 FOOT DEEP BY 250 FOOT WIDE ACCESS CHANNEL

SCALE: 1"=100'



SECTION A-A, TYPICAL

SCALE: HOR. 1"=20'
VERT. 1"=5'



GENERAL NOTES:

Contours are in one foot intervals and are referred to the plane of Mean Low Water (M.L.W.).

Hydrography from survey of Oct. 1988.

"The information depicted on this map represents the results of surveys made on the dates indicated, and can only be considered as indicating the general conditions existing at that time."

Fieldbooks: RH 3906 and RH 3887

GRAPHIC SCALES

1"=5' — 5' 0 5' 10'

1"=20' — 20' 0 20' 40'

1"=100' — 100' 0 100' 200'

SAFETY PAYS

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
SUBMITTED		
PROJECT ENGINEER		
REVIEWED		
CHIEF, OPN. & R. E. BRANCH		
APPROVING RECOMMENDED		
CHIEF, ENGINEERING DIVISION		

PROVINCETOWN HARBOR
NAVIGATION IMPROVEMENT STUDY
SELECTED PLAN

APPROVED _____ DATE _____

CHIEF, ENGINEERING DIVISION

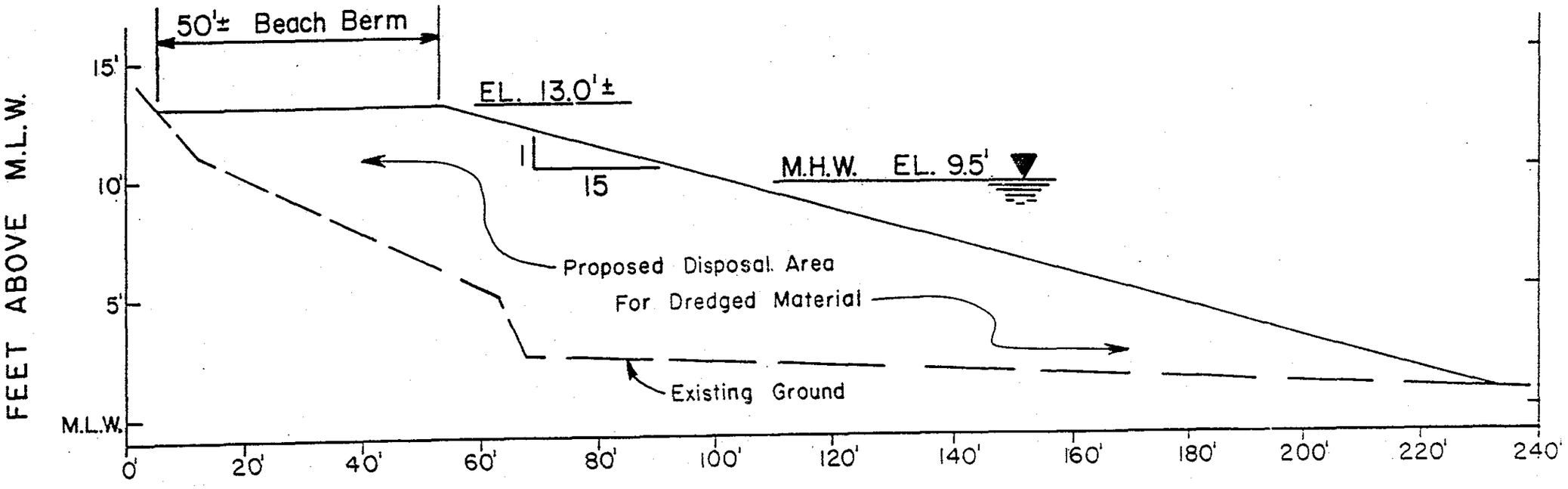
SCALE AS SHOWN | SPEC. NO. DACW 33

PLATE 2-2

DRAWING NUMBER

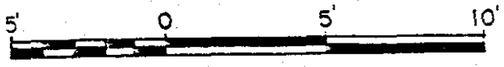
SHEET

BEACH DISPOSAL AREA
TYPICAL SECTION

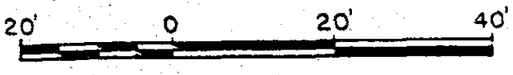


SCALES:

VER. 1" = 5'



HOR. 1" = 20'



PROVINCETOWN HARBOR
Navigation Improvement Study

BEACH DISPOSAL AREA
TYPICAL SECTION

PLATE 2-3

PUBLIC INVOLVEMENT

APPENDIX 3

PUBLIC INVOLVEMENT

TABLE OF CONTENTS

Objective

In the broadest sense, the "public" consists of: non-Corps of Engineers entities, Federal, State, Local and regional agencies as well as public and private organizations and individual citizens. The public participation program is intended to provide a continuous two-way communication process which will maximize the opportunity for the public to (1) be involved in the overall planning process; (2) be aware of the study process; and (3) make decisions that would have affects on the lives of those in the study area. Inasmuch as major decisions made throughout the study will be based upon expressed needs of local, county, State and regional officials as well as the general public, it is necessary to establish a mechanism to channel information to interested participants and to funnel their responses to those conducting the study.

Public Involvement

In February 1979, the Selectmen of Provincetown requested the Crops to investigate navigation problems at Provincetown Harbor, and to develop a plan to reduce or eliminate the navigation problems affecting the commercial fishing fleet. Our initial study was completed in 1979 and concluded that Federal participation in the construction of a breakwater and a inner harbor navigation channel was economically justified.

In November 1983, town officials from Provincetown met with Corps representatives to discuss the feasibility study in light of recently imposed count restrictions on the town wharf "MacMillian Wharf". Restrictions were imposed on the wharf due to the structural instability of piles to safely carry daily loads. Because of the Wharf's importance in sustaining the areas economic vitality, the town appropriated funds to repair the wharf. The town requested that the Corps' feasibility study be held in abeyance and be resumed at some point in the future when the improvements to the wharf are substantially completed.

In January 1988, the town manager of Provincetown notified the Corps of the town's ongoing harbor development program and reaffirmed the town's desire to pursue Federal Harbor improvements at this time.

Coordination has been maintained throughout the study with the U.S. Fish and Wildlife Service and the Massachusetts Coastal Zone Management Agency (CZM). Through this coordination potential effects to fish and wildlife habitat were identified. This coordination has resulted in several letters from these agencies recommending various measures that would help reduce the potential adverse effects of the proposed project. Many of these measures have been incorporated into the project. Final coordination letters were received from these agencies during the 30-day public review period (See Pertinent Correspondence).

During January 1990, over 70 draft copies of this repot were distributed to other Federal, State, and local agencies for public review. This gave all interested parties the opportunity to comment on the finding of our study. During the public review period, we received several letters of support along with several others that raised questions and concerns about the findings of our study. These letters, along with our responses are maintained in Appendix A.

Future Public Involvement

This repot has been finalized and forwarded to the Office of the Chief of Engineers in Washington for review and approval to begin preparation of plans and specifications. Public coordination will be maintained through the construction period.

Pertinent Correspondence

Agency/Organization	*Date*
U.S. Department of Commerce National Marine Fisheries Service	5 April 1990
U.S. Environmental Protection Agency	9 March 1990
Commonwealth of Massachusetts, Division of Waterways	7 March 1990
Center for Coastal Studies	16 February 1990
Commonwealth of Massachusetts Historic Commission	13 February 1990
Commonwealth of Massachusetts, Coastal Zone Management Agency (Corps response follows letter)	8 February 1990
U.S. Department of the Interior, Fish & Wildlife Service (Corps response follows letter)	26 January 1990
U.S. Environmental Protection Agency	22 May 1989
U.S. Department of the Interior, Fish and Wildlife Service	26 April 1989
Town of Provincetown Assistant to Town Manager	28 February 1989
Town of Provincetown Town Manager	29 January 1988
Town of Provincetown Assistant to the Town Manager	30 April 1986

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northeast Region
Management Division
Habitat Conservation Branch
One Blackburn Drive
Gloucester, MA 01930-2298

April 5, 1990

Mr. Carl Boutilier
Chief, Navigation Branch
New England Division
Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

Dear Mr. Boutilier

We do not anticipate any adverse impacts to fishery resources from the proposed navigational improvements project in Provincetown Harbor, Provincetown, Massachusetts provided dredging is scheduled to avoid impacts to spawning winter flounder.

Project plans call for establishing a Federal navigational channel from the Federal breakwater to MacMillian wharf. Approximately 20,000 cubic yards of clean sand will be dredged and hydraulically pumped to an adjacent beach for beach nourishment. The purpose of the project is to facilitate easy access to MacMillian wharf for commercial fishermen.

We are pleased to see that the dredge spoils will be utilized in a beneficial manner and we encourage this use whenever possible. The proposed dredging plan states that dredging will occur from September 1, 1990 to May 31, 1991. The Massachusetts Division of Marine Fisheries has indicated that winter flounder spawn in this area from February through June which coincides with the dredging schedule. Since there is no one specific spawning area, it would be difficult to avoid spawning activities while dredging. Therefore, to avoid adverse impacts to these species, dredging should not be scheduled from February 1 through June 30.

If you have any questions, please contact Chris Mantzaris at (508) 281-9346.

Sincerely,

Thomas E. Bigford

Thomas E. Bigford
Branch Chief

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

March 09, 1990

Colonel Daniel M. Wilson
Division Engineer
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149

Dear Colonel Wilson.

This letter concerns the copy of the Draft Section 107 Navigation Detailed Project Report, including an Environmental Assessment, Section 404(b)(1) Evaluation and a Finding of No Significant Impact for navigation improvements in Provincetown, Massachusetts.

The proposed project would entail removal of 20,000 cubic yards of sediment. The material will be hydraulically dredged and pumped onto an adjacent beach for beach nourishment purposes. The proposed improvements are for the benefit of commercial fishing interests.

In an earlier correspondence, we recommended beach nourishment for the dredged material provided that there were no threatened or endangered species at the site. The proposed beach nourishment site has no piping plovers or least terns. Therefore, we do not anticipate any adverse long term environmental effect associated with this project.

We are pleased to be able to provide these coments on the Draft Detailed Project Report. Please keep us informed of the progress of this project by contacting Mr. Melvin P. Holmes of the Wetlands Protection Section at (617) 565-4433.

Sincerely,

David A. Fierra, Director
Water Management Division

cc. NMFS, Gloucester, MA
USFWS, Concord, NH
MA DEP, Boston, MA
R. Manfredonia, WQB

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Management

March 7, 1990

DIVISION OF WATERWAYS

349 Lincoln Street
Bldg. #45
Hingham, MA 02043
(617) 740-1600

Daniel M. Wilson
Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA. 02254-9149

RE: Provincetown - Federal
Dredging Project in
Provincetown Harbor

Dear Colonel Wilson:

The Division has reviewed your agency's report on the above captioned project and is prepared to enter into the local cooperation agreement. At this time we have not received a formal request to cost share the local contribution with the Town however we did forward a letter, copy enclosed, to the Town Managers advising them that we were willing to consider the project.

Unfortunately due to the Cap on our bond spending program we can not participate in any new projects however we optimistically look forward to the near future when we can undertake this project. Although we can not presently predict a schedule we estimate that in 18 months we will be able to rejuvenate our program and be back at a normal level of activity.

Should the Town determine that they have sufficient funds to commence the project earlier we are prepared to expedite the local cooperation agreement.

Should you have any further questions please contact me at (617) 740-1600.

Very truly yours,

Eugene F. Cavanaugh
Director and Chief Engineer

EFC: mc

encl.

cc: Michele Jarusiewicz, Town Manager
Senator Henri Rauschenbach

MAR 19 1990

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Management

DIVISION OF WATERWAYS
349 Lincoln Street
Bldg. #45
Hingham, MA 02043
(617) 740-1600

February 22, 1990

Michele Jarusiewicz, Town Manager
Town of Provincetown
Town Hall
Provincetown, MA 02657

Re: Corps of Engineers Report
Provincetown Harbor Dredging
PROVINCETOWN

Dear Ms. Jarusiewicz:

The Division of Waterways has received and reviewed copies of the U.S. Army Corps of Engineers Detailed Project Report and Environmental Assessment for a navigational project at Provincetown Harbor. Estimated cost of the project is $282,000, with $56,400 indicated as the local share, for dredging a channel 2,000 ft. long by 250 feet wide by 13 ft. deep at MLW (mean low water). The Corps has indicated a willingness to pursue the project pending concurrence with a draft Local Cooperation Agreement and cost sharing by the Department of Environmental Management and the Town of Provincetown.

The Division is interested in obtaining an expression of the Town of Provincetown's intent relative to pursuing the project. The Division will be pleased to entertain a petition from the town for cost-sharing on a 25% town-75% Commonwealth funding basis, and have enclosed a copy of our River and Harbors Program brochure should you decide to follow this course. While we do not have the funds for immediate participation, we will maintain your petition in our files until the next round of Rivers and Harbors Hearings, and will advise you as to when these will occur as soon as we have a date established.

If you have any questions or would like to meet with us on this project, please contact Leslie Lewis, Rivers and Harbors Program, at (617) 740-1602.

Very truly yours,

Eugene F. Cavanaugh
Director and Chief Engineer

LRL/mel
Enclosures

Center for Coastal Studies

A Private Non-Profit Organization for Research and Education in the Coastal Environment

59 COMMERCIAL STREET • BOX 1036 • PROVINCETOWN • MASSACHUSETTS 02657 • (508) 487-3622

February 16, 1990

Robert Russo
Corps of Engineers, NED
424 Trapelo Road
Waltham, MA 02254-9149

Dear Robert:

My comments re: the Provincetown Harbor Dredging Plan are attached with the marked up copies: Basically NIT-PIC's.

Sincerely,

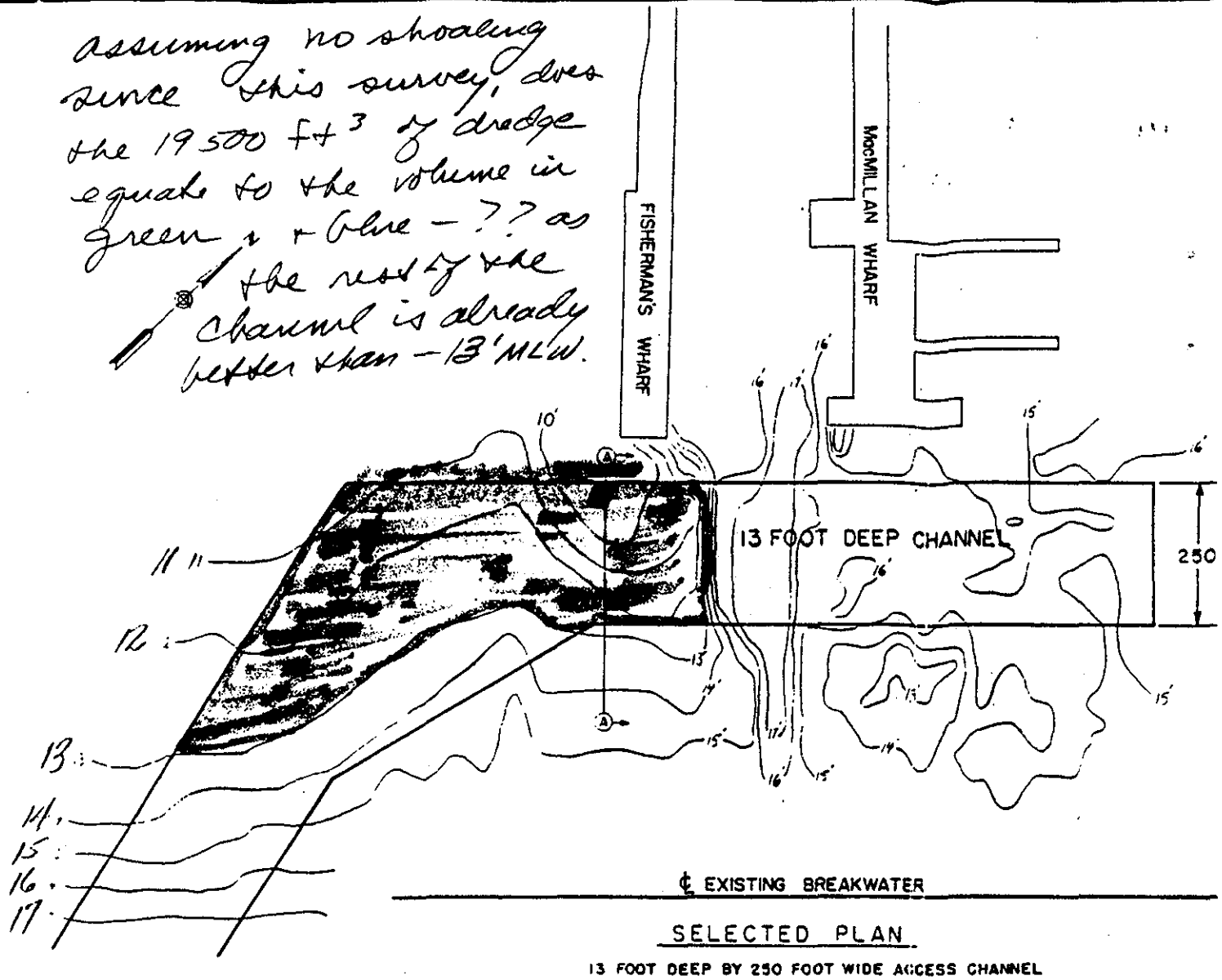
Charlie

Charles T. Westcott

CTW:mrm

P.S. These comments do not reflect the organization and are purely editorial CW

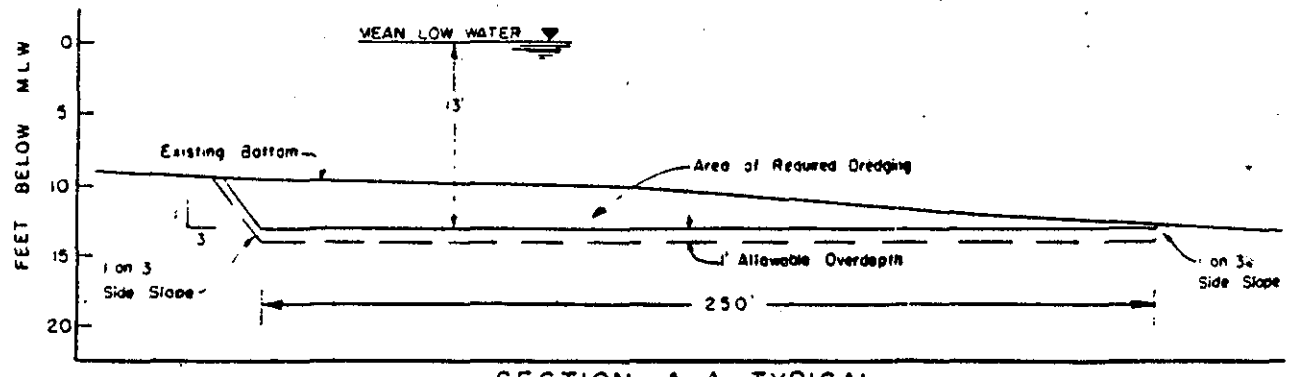
assuming no shoaling since this survey, does the 19500 ft^3 of dredge equate to the volume in green + blue – ?? as the rest of the channel is already better than –13' MLW.



SELECTED PLAN

13 FOOT DEEP BY 250 FOOT WIDE ACCESS CHANNEL

SCALE: 1"=100'



SECTION A-A, TYPICAL

SCALE: HOR. 1"=20'
VERT. 1"=5'

Plate 2-2

Environmental Assessment

A. Introduction

1. Purpose

A navigation improvement project is proposed for Provincetown Harbor, [illegible]chusetts. Sand shoaling of the inner harbor area from the town pier, [illegible]illan Wharf", to deep water just outside the Federal breakwater has [illegible]ed tidal delays, and some grounding and dragging damages for deep [illegible] (>10 feet) commercial fishing boats attempting to enter or leave the [illegible] pier area. Much of the shoaling occurs at the west end of the [illegible]al breakwater. The currently proposed plan would provide for the [illegible]blishment of a Federal navigation channel from just outside the [illegible]al breakwater in Provincetown Harbor to the town pier. This [illegible]ovement would insure safe and efficient access for commercial fishing [illegible] traveling to and from deep water and the protected shore facilities [illegible] Provincetown Harbor.

Provincetown Harbor is located in Provincetown, Massachusetts. [illegible]incetown is situated at the northernmost tip of Cape Cod (see Figure [illegible] Cape Cod Bay is located to the south and east of Provincetown. The [illegible]ntic Ocean is located to the north and west of Provincetown. [illegible]incetown Harbor is 3.5 miles long and slightly over a mile wide. [illegible]in the harbor there is a town wharf (MacMillan Wharf), a private [illegible]na, a U.S. Coast Guard pier, and several old wooden piers which jut [illegible] the harbor from the beach. Protecting the harbor is a solid fill [illegible]water located 500 yards north of the town pier. This 2,500 foot long [illegible]al breakwater extends in a east-west direction.

SW-NE

2. Need

Shoaling of Provincetown's i[illegible] commercial fishing fleet in [illegible]erienced by these vessels hav[illegible] drafts greater than 10 feet [illegible]reased labor time and fuel co[illegible]nel from the town pier to de[illegible]ce or eliminate these delays

Solid fill? or rubble mound - ? solid fill terminology is dangerous in this area!!!

It is really SEasterly of the MacMillan Wharf-Town Pier. It runs generally NE-SW!

3. Authority

In a letter dated 6 December [illegible]ested the Army Corps of Engin[illegible]rease the safety and protectio[illegible]rity for this study is grant[illegible] [illegible] of the 1960 River [illegible]arbor Act, as amended.

4. Prior Federal Improvements

There are two existing Federal projects in Provincetown Harbor. Both [illegible] adopted in 1910, modified in 1948, and amended in 1967. One is a

As shown in Plate 4, the selected plan will provide an access channel 2,000 ft. long, 250 ft. wide by 13 ft. deep at MLW located to the west and just south of the Federal breakwater and terminating approximately 320 ft. east of MacMillan Wharf. It is estimated that three steel can buoys will be necessary for boat safety, at an initial cost of $4,000 per buoy. The sandy material to be removed from the proposed channel would be hydraulically dredged and pumped onto the adjacent beach to the northeast of Fisherman's Wharf for disposal. The selected plan is estimated to require maintenance at least twice during the project's life time. The channel is anticipated to shoal in at a rate of 390 cu. yds. per year. This shoaling rate has been used in determining the selected plan's annual cost. Construction of the selected plan of improvement should require approximately three weeks to complete and will be undertaken between mid October to end of March time frame.

The first cost of construction
purposes of the benefit to cost
of required aids to navigation
$5,500. The total project cost i

direction is generally NW of Fishermans Wharf.

V ENVIRONMENTAL

No significant environmen
construction of the navigation
and temporary effects on the
amounts of turbidity in the inner harbor. The small percentage of dredged ... that becomes suspended in the water column would rapidly settle out due to the sandy nature of the material. Therefore, any turbidity effects associated with dredging would be minor and cease with completion of the dredging activity. Based on historical shoaling rates, maintenance dredging to sustain the project depth is expected to be required every 15 to 20 years. The hydraulic dredging of 19,500 cu. yds. of substrate from the proposed channel would destroy the benthic community and associated organisms by physical removal. The recolonization of organisms to pre-dredge levels would generally occur within a few seasons.

The use of a hydraulic dredge would cause localized turbidity during the rele
the dredged material at the disposal site. The hydraulic pipeline would rele
onto the beach and into the near shore waters. Some material may be carr
from the disposal site. However, due to the sandy nature of the subst
amounts of turbidity would be expected. Turbidity would cease w
the operation.

The dredged material would be deposited on the be
beach would be needed to dispose of the dredged
the material to form a 50 foot berm with a 1:15
below MLW. Once the material has been plac
and littoral currents. Since the predominant d
material should not cause significant shoaling o
predominant direction of littoral drift is to the we
is small. No more than one to three percent of the
is expected to be moved from the site per year. The a
expected to cause significant shoaling in other areas of

Date

Along the east end of the breakwater shoaling has become quite extensive. Currently only boats that draw 7 ft. or less attempt navigation along the breakwater's east end. Most boats utilize the west end of the breakwater to enter and exit the harbor. Depths along the west end of the inner harbor range from -10 ft. to -17 ft. MLW. This depth is sufficient for the recreational fleet and for some of the commercial fleet. However, there are eleven large draggers which experience dragging damages to their propellers and rudders. It is estimated that these fishing vessels experience annually grounding or dragging damages of $3,500 per vessel while attempting to navigate the inner harbor. The eleven large fishing boats also incur tidal delays. These fishing boats must wait to enter or exit the harbor at low tide to avoid damage. Based on information provided by the fishermen, the tidal delays occur 4 to 5 times per month and last 1 to 1-1/2 hours per delay.

There is also a problem in the harbor concerning the lack of protection from southwest winds and waves. There is currently a court order restricting the use of the "T" section of MacMillan Wharf when the south
the wharf's structural problems.
boats tied up at the "T" section of
of the harbor near Long Point, ov
Harbormaster that, on average, i
moved from the wharf eight time
average of over 5 hours until the
waves also cause problems to the
damages and off-loading delays.
60 ft. experience annual damage
seven draggers with lengths less

These fishing boats must wait for high tide to enter or exit the inner harbor to avoid damage.

Southwest winds also cause problems to the Provincetown recreational fleet. These problems include boats breaking free of their moorings, chaffing and collision damages and general inconveniences. Three recreational vessels have been identified to incur annual damage costs of $10,000 per vessel from problems caused by the strong winds and waves.

Future Conditions if no Federal Action is Taken

Without Federal involvement in the provision of navigation improvements, the existing conditions and trends, as previously described, will continue in Provincetown Harbor. The area's potential opportunity for growth as a commercial fishery and recreational resources would not be fully realized. Current utilization of the harbor would continue to decline and the commercial fishing fleet would be reduced in size and efficiency and perhaps be eliminated as shoaling further restricts navigation. Groundings and tidal delays in Provincetown's inner harbor will increase as shoaling continues. Increased repair costs, down-time and tidal delays will result in increasing the cost of the commercial fleet doing business at Provincetown Harbor.

Without some harbor improvement plan, both the commercial and recreational fleets in Provincetown Harbor, will continue to be moved causing those vessels to incur fuel and labor time cost during periods of strong southwest winds. Boats will continue to experience damages from banging against the pier during periods of southwest winds, and fishermen will continue to experience off-loading delays and their associated costs when the winds and waves are too strong to off-load safely.

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

REPLY TO
ATTENTION OF

January 31, 1990

Planning Division
Coastal Development Section

RECEIVED
FEB 2 1990
MASS. HIST. COMM.

Ms. Valerie A. Talmage
Executive Director
State Historic Pres. Officer
80 Boylston Street
Boston, MA. 02116

Dear Ms. Talmage:

I am forwarding for your review and comment the attached Draft Detailed Project Report, including an Environmental Assessment, Section 404(b)(1) Evaluation and a Finding of No Significant Impact for navigation improvements in Provincetown Harbor, Massachusetts.

The recommended plan of improvement consists of hydraulic dredging to declare a Federal access channel to be located just east of the existing Federal breakwater and extending to McMillan Wharf. The recommended channel would reduce tidal delays and navigation hazards within the inner Provincetown Harbor. The proposed improvements would benefit the commercial fishing interests of Provincetown.

The proposed project would require the removal of approximately 20,000 cubic yards of sandy material. The material would be pumped onto the adjacent beach to the northeast for disposal. The estimated first cost of construction for the proposed Federal improvements would be $282,000. The non-Federal cost share would be 20 percent of the first cost, or $56,400.

The local sponsor, the Massachusetts Department of Environmental Management, in conjunction with the town of Provincetown, must concur with the draft Local Cooperation Agreement and agree to the cost sharing. The local cost share will be provided by the sponsor after the plans and specifications are prepared and immediately prior to construction. Upon receipt of a letter of intent and a favorable review and documentation from the appropriate Federal and state agencies, we will forward our report to the Office of the Chief of Engineers in Washington, DC for final review and approval.

Approval of the document would authorize the project for initiation of detailed plans and specifications. Authorization and funding for construction would require the approval of the Assistant Secretary of the Army for Civil Works and would be dependent upon future appropriations.

Concurrence Brona Simon DSHPO
Feb. 13, 1990 for
EXECUTIVE DIRECTOR
MASSACHUSETTS
HISTORICAL COMMISSION

Any comments you may have should reach me no later than thirty (30) days from the date of this letter. If you have any questions, please feel free to contact me at (617) 647-8220. The Project Manager, Mr. Robert Russo, is coordinating the investigation. Should your staff desire further information, he can be reached at (617) 647-8557.

Sincerely,

Daniel M. Wilson
Colonel, Corps of Engineers
Division Engineer

Enclosure

MAILING LIST

Honorable Michael S. Dukakis
Governor of the Commonwealth of Massachusetts
State House
Boston, Massachusetts 02133

Honorable Edward M. Kennedy
United States Senate
Washington, DC 20510-2101
(315 Russell)

Honorable Edward M. Kennedy
United States Senator
2400A JFK Federal Bldg.
Boston, MA. 02203

Honorable John F. Kerry
United States Senate
Washington, DC 20510-2102
(421 Russell)

Honorable John F. Kerry
United States Senator
3220 Transportation Bldg.
10 Park Plaza
Boston, MA. 02116

Honorable Gerry Studds
House of Representatives
Washington, DC 20515-2106
(2432 Rayburn)

Honorable Patricia Fiero
Representative in the General Court
State House, Room 540
Boston, MA. 02133

Honorable Robert Buell
Senator in the General Court
State House, Room 416B
Boston, MA. 02133

MAILING LIST cont.

Mr. Ronald Lambertson
Regional Director, Region 5
U.S. Fish and Wildlife Service
One Gateway Center
Newton Corner, MA. 02158

copy furnished with enclosure to:
Mr. Gordon Beckett, Supv. (USF&W)
Mr. Michael Tehan (USF&W)

Rear Admiral Robert B. Johanson
First Coast Guard District
150 Causeway Street
Boston, MA. 02114

Mr. Richard B. Roe
Regional Director
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA. 01930

copy furnished with enclosure to:
Mr. Richard H. Shaefer (NMFS)
Mr. Thomas E. Bigford (NMFS)
Mr. Douglas Beach (NMFS)

Mr. Rusty Iwanowicz
Massachusetts Division of
Fisheries and Wildlife
Field Headquarters
Westboro, MA. 01581

Mr. Daniel S. Greenbaum
Commissioner
Massachusetts D.E.Q.E.
1 Winter Street, 3rd Fl.
Boston, MA. 02108

Ms. Michelle Jarusiewicz
Town Manager
Town Hall
Provincetown, MA 02657

Ms. Valerie A. Talmage
Executive Director
State Historic Pres. Officer
80 Boylston Street
Boston, MA. 02116

Mr. Paul Keough
Actg. Regional Administrator
U.S. EPA, Region 1
JFK Federal Building
Boston, MA. 02203-2211

copy furnished with enclosure to:
Mr. Douglas Thompson
Chief, Wetlands Prot. Sect.

Mr. Steven Bliven
Acting Director
Massachusetts Office of
Coastal Zone Management
100 Cambridge Street
Boston, MA. 02202

copy furnished with enclosure to:
Mr. Bradley W. Barr (CZM)

Mr. Eugene F. Cavanaugh
Director, MA. Div. of Waterways
349 Lincoln Street
Building #45
Hingham, MA. 02043

Mr. Richard E. Kendall
Commissioner
Massachusetts D.E.M.
100 Cambridge Street
Boston, MA. 02202

COASTAL ZONE
MANAGEMENT

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

February 8, 1990

Col. Daniel M. Wilson
Division Engineer
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254-9149

RE: Proposed Improvements to Provincetown Harbor, Massachusetts

Dear Colonel Wilson:

Thank you for your letter of 31 January, 1990, regarding the proposed navigational improvements to Provincetown Harbor. We generally agree with the conclusions reached in the Detailed Project Report and Environmental Assessment (DPR/EA). While we support the selected plan, it is unfortunate that the analysis yielded a negative recommendation on the breakwater alternative. While we accede to the results of the analysis, the dredging of a channel will resolve only some of the serious problems faced by vessels in the Harbor. Damage and delays attributed to strong southwest winds are clearly identified in the DPR but are examples of problems that would not be solved via the "dredging-only" option. The benefits derived from the construction of another breakwater are projected to be significant, with the drawback being increased construction and maintenance costs. If there is way we can work together to develop a creative method to overcome the negative recommendation on the "breakwater option", I believe that it is in all of our interests to do so.

We appreciate the opportunity to comment on this proposal. Please be reminded of your obligation to file a Federal Consistency determination for the project so that we might initiate our formal review. If you or your staff have any questions or require additional clarification of our comments, please contact Brad Barr of my staff at 727-9530.

Sincerely,

Jeffrey R. Benoit
Director

RFD/BWB
cc: Eugene Cavenaugh, DEM-Waterways
Michelle Jarusiewicz, Town of Provincetown

FEB 22 1990

RESPONSE TO MASSACHUSETTS COASTAL ZONE MANAGEMENT LETTER:

The Corps of Engineers (COE) has looked into alternative solutions to the negative recommendation of the rubblemound breakwater alternative. Besides a rubblemound breakwater, an A-frame and floating breakwater alternatives were also explored. The A-frame breakwater was also not in preventing damages from long period waves. Although there are some benefits associated with construction of a breakwater, our present guidelines do not allow us to become involved with projects which are not economically justified.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
400 RALPH PILL MARKETPLACE
22 BRIDGE STREET
CONCORD, NEW HAMPSHIRE 03301-4901

Joseph L. Ignazio
Chief, Planning Division
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

January 26, 1990

Dear Mr. Ignazio:

This is in response to your letter of December 26, 1989, requesting our views on the draft Detailed Project Report for the proposed navigation improvement project in Provincetown Harbor, Provincetown, Massachusetts. We hereby submit our final Fish and Wildlife Coordination Act Report on the project in accordance with Section 2(b) of the Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq.

The proposed project involves the establishment of a federal navigation channel 2000 feet long, 250 feet wide and 13 feet deep, from the federal breakwater to MacMillian Wharf, the town fish pier. Approximately 19,500 cubic yards of sandy material would be hydraulically dredged, with disposal on 600 linear feet of beach southwest of the town pier.

This office provided comments on the proposed navigation project early in the planning process. Our letter of April 26, 1989 noted that no federally listed or proposed threatened or endangered species were known to occur in the project vicinity. Our June 27, 1989 letter to the Planning Division identified fish and wildlife resources of the project area and recommended that dredging be scheduled to avoid impacts to spawning winter flounder. At the time of our June 27 letter, benthic sampling results were not available and we were unable to comment on the impacts to the benthic community.

The draft Detailed Project Report (DPR) generally provides a good description of fish and wildlife resources in the project area and potential project impacts. The benthic sampling results from the proposed dredge site indicate a moderate diversity and population of benthic organisms, while sampling results from the proposed disposal site demonstrate a benthic community of relatively low diversity and numbers. Dredging and disposal operations at these sites would eliminate local benthic communities. Recolonization of the disturbed areas by opportunistic benthic organisms would be expected to occur within a few years. We would expect no far field impacts to marine resources at either the proposed dredge or disposal sites as a result of dredging or disposal activities. Benthic recolonization would also be affected by future use of the channel by vessels, shoaling rates and maintenance dredging. There will be cumulative impacts to the marine environment in Provincetown Harbor, directly and indirectly associated with the proposed project. These impacts should be further addressed in the final Detailed Project Report.

The proposed mitigation plans state that the window for the operations will be from September 1 to May 31, to avoid impacts to spawning benthic species. In our June 27 letter, we recommended that no dredging be scheduled from February through early June to minimize impacts to spawning winter flounder. The majority of winter flounder spawn in kettle holes within embayments or depressions within estuaries, however, they will spawn in areas of open water where fine macroalgae concentrate. Peak spawning activity for winter flounder is generally in March. To avoid impacts to winter flounder potentially spawning in the project vicinity, the final DPR should include our recommendation that dredging operations not occur during the period of February to early June.

One minor correction to note on page EA-11. Great black-backed gulls were incorrectly identified as black gulls.

We appreciate the opportunity to review and comment on the draft Detailed Project Report. Please contact Susi von Oettingen of my staff at (603) 225-1411 if we can be of further assistance.

Sincerely yours,

Gordon E. Beckett

Gordon E. Beckett
Supervisor
New England Field Office

RESPONSE TO FISH AND WILDLIFE COMMENTS:

Paragraph 4:

Maintenance dredging would not be required for 15 to 20 years after improvement dredging, based on historical shoaling rates. The disposal site for future maintenance dredging would most likely continue to be the beach near the wharf area. Cumulative impacts associated with this project would include temporary disruption of the benthic community from dredging and disposal activities. Due to the low shoaling rate and the relative stability of the beach area to the west of the dredge site, no significant cumulative impacts are anticipated. Some of the dredged material placed on the beach would find its way into the littoral zone and cause significant shoaling in other parts of the harbor. The above impacts are discussed further in the Environmental Assessment.

Paragraph 5:

Initial coordination with the Massachusetts Department of Marine Fisheries (MDMF) had determined that the proposed project area is not a significant finfish spawning area (see Appendix B, Environmental Assessment Coordination letters). However, because there is a potential impact to winter flounder spawning areas in Provincetown Harbor, the MDMF concur with the U.S. Fish & Wildlife Service that dredging activities should also be prohibited from late winter through spring. This is due to the depleted winter flounder stocks in the area. Therefore, the Corps of Engineers (COE) will only allow dredging activities between September 1 to January 31.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203-2211

May 22, 1989

Mr. Carl G. Boutilier
Chief, Navigation Branch
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Mr. Boutilier:

This is in response to your letter of April 14, 1989, requesting our comments on the proposed establishment of a Federal navigation channel for Provincetown Harbor, in Provincetown, Massachusetts.

We understand that the proposed project would establish a Federal navigation channel 4,000 feet long from just outside the Federal breakwater to MacMillian Wharf(the town pier). Approximately 46,000 cubic yards of sandy material would be removed with a hydraulic dredge and pumped onto the beach southwest of the town pier. The material would be used for beach nourishment with approximately 1200 linear feet of beach replenished.

Provided that the sediment analysis indicates that the dredged material is acceptable for beach nourishment, we do not anticipated any significant adverse environmental effects to occur from intiation of this project. However, if it is determined that the dredged material is not acceptable for beach nourishment, please contact this office for further coordination on alternative disposal options.

We appreciate the opportunity to comment on this project. For further coordination on this project contact Melvin P. Holmes at 617 565-4433.

Sincerely,

Douglas A. Thompson, Chief
Wetlands Protection Section

cc: NMFS, Gloucester, MA
USFWS, Concord, NH

United States Department of the Interior

FISH AND WILDLIFE SERVICE
400 RALPH PILL MARKETPLACE
22 BRIDGE STREET
CONCORD, NEW HAMPSHIRE 03301-4901

Mr. Joseph Ignazio, Chief
Planning Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

April 26, 1989

ATTN: Impact Analysis Branch

Dear Mr. Ignazio:

This responds to your letter dated April 14, 1989, for information on the presence of Federally listed and proposed endangered or threatened species in accordance with a proposed Navigation Improvement Project in Provincetown, Massachusetts.

No Federally listed or proposed threatened and endangered species under our jurisdiction are known to occur in the project area, with the exception of occasional transient individuals. However, you may wish to contact Brad Blodgett of the Massachusetts Division of Fisheries and Wildlife, Rte. 135, North Drive, Westboro, Massachusetts, at 508-366-4470, for information on state listed species. No Biological Assessment or further consultation is required with us under Section 7 of the Endangered Species Act. Should project plans change, or additional information on listed or proposed species becomes available, this determination may be reconsidered.

This response relates only to endangered species under our jurisdiction. It does not address other legislation or our responsibilities under the Fish and Wildlife Coordination Act.

A list of Federally designated endangered and threatened species in Massachusetts is inclosed for your information. Thank you for your cooperation and please contact Susi von Oettingen of this office at 603-225-1411 if we can be of further assistance.

Sincerely yours,

Gordon E. Beckett

Inclosure

Gordon E. Beckett
Supervisor
New England Area

IN MASSACHUSETTS

me	Scientific Name	Status	Distribution
geon, shortnose*	Acipenser brevirostrum	E	Connecticut River & Atlantic Coastal Waters
REPTILES:			
Turtle, green*	Chelonia mydas	T	Oceanic straggler in Southern New England
Turtle, hawksbill*	Eretmochelys imbricata	E	Oceanic straggler in Southern New England
Turtle, leatherback*	Dermochelys coriacea	E	Oceanic summer resident
Turtle, loggerhead*	Caretta caretta	T	Oceanic summer resident
Turtle, Atlantic ridley*	Lepidochelys kempii	E	Oceanic summer resident
Turtle, Plymouth red-bellied	Chrysemys rubriventris bangsi	E	Plymouth & Dukes Counties
BIRDS:			
Eagle, bald	Haliaeetus leucocephalus	E	Entire state
Falcon, American peregrine	Falco peregrinus anatum	E	Entire state-reestablishment to former breeding range in progress
Falcon, Arctic peregrine	Falco peregrinus tundrius	E	Entire state migratory-no nesting
Plover, Piping	Charadrius melodus	T	Atlantic coast
Roseate Tern	Sterna dougallii dougallii	E	Atlantic Coast
MAMMALS:			
Cougar, eastern	Felis concolor couguar	E	Entire state-may be extinct
Whale, blue*	Balaenoptera musculus	E	Oceanic
Whale, finback*	Balaenoptera physalus	E	Oceanic
Whale, humpback*	Megaptera novaeangliae	E	Oceanic
Whale, right*	Eubalaena spp. (all species)	E	Oceanic
Whale, sei*	Balaenoptera borealis	E	Oceanic
Whale, sperm*	Physeter catodon	E	Oceanic
MOLLUSKS: NONE			
PLANTS:			
Small Whorled Pogonia	Isotria medeoloides	E	Hampshire, Essex Hampden, Worcester Middlesex Counties
Gerardia, Sandplain	Agalinus acuta	E	Barnstable County

* Except for sea turtle nesting habitat, principal responsiblity for these species is vested with the National Marine Fisheries Service

Rev. 1/20/89

Town of Provincetown

MASSACHUSETTS 02657
(508) 487-3900

February 28, 1989

Robert Russo
U.S. Army Corps of Engineers
Planning Division
421 Trapelo Road
Waltham, MA 02254-9149

RE: PROVINCETOWN HARBOR PROJECT

Dear Mr. Russo,

Enclosed is a package of information put together by Mr. McNulty related to the Provincetown Harbor Project. It includes a map that he created which incorporates your drawing for the proposed channel, the area dredged by the Town for the finger piers, and proposed projects at MacMillan Pier and at Cabral's Pier. Please note that there is a small area not included in either the ACOE's proposed project or in the area already dredged.

On behalf of the Town, I would like to express our appreciation for all of your efforts as well as those of the other staff members at the Corps. We look forward to working with the Corps of Engineers on improvements to our harbor - our most vital resource.

Very Truly Yours,

Michelle Jarusiewicz
Assistant to Town Manager

Town of Provincetown

MASSACHUSETTS 02657
(617) 487-3900

January 29, 1988

Colonel Thomas A. Rhen
Division Engineer
Corps of Engineers
New England Division
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Rhen:

Thank you for your letter of January 13, 1988. I am writing to assure you that Provincetown's harbor facilities development program is still active and still a major priority. We need your help and we ask that you continue the Corps' Provincetown Harbor Program.

As you know, by 1981, Provincetown's MacMillan Pier had, over the 25 years since its construction, succumbed to the effects of wind, wave, and time, and was no longer able to safely serve the fishery or other users. The Town had engineering studies performed. The condition of the Pier was found to be so bad that the Town's voters appropriated over $300,000. for temporary repairs to arrest the almost terminal deterioration of the Pier.

We completed temporary repair work (Phase I) in January of 1983. We then undertook the development of a long range program of planning and improvements for the Pier and shoreside support facilities. By 1984 our planning had advanced to the stage where the Town's voters committed $2,000,000. to begin restoration of the existing pier and the development of new facilities for the Provincetown fishing fleet and other users.

With the assistance of the U.S. Economic Development Administration, the Massachusetts Department of Environmental Management, and the Massachusetts Office of Coastal Zone Management, we designed and started construction of the restoration phase of our plan (Phase II). The Phase II portion of our long range program is funded at $2,800,000. and is now approximately 70% complete. Provincetown is very fortunate in having the active support of Governor Dukakis and the Massachusetts legislature for the development of our harbor.

We have also received significant help from Congressman Gerry Studds and, as you know, we have benefited from the support of the Corps of Engineers since we started our harbor revitalization in the early 1980's.

In December of 1987 the Governor and the Legislature passed legislation

which included $6,000,000. which we hope to utilize for Phase III of Provincetown's harbor facilities program. We plan that Phase III will enable Provincetown to serve its fishery, other commercial users, and the boating public long into the future. As we envision the Phase III configuration, it will be essential to have those elements which you mentioned in your letter, i.e., access channels to the Town pier, a maneuvering basin, and protection from Southwesterly wind effects.

Until we had the Commonwealth's commitment, we were not in a position to assure the Corps of our ability to go forward. We believe that we can now provide this assurance.

Without the Corps' help, we will not be able to realize the Town's long term goals.

In order to provide you with some idea of our Phase III concepts, we are forwarding a copy of the 1986 "Preliminary Design Report." Please consider the report as indicative only. Now that we are assured of funding, we intend to review the 1986 work thoroughly and produce a final Phase III plan and design.

We look forward to meeting with the Corps' representatives in the very near future to discuss and coordinate the implementation of Phase III.

On behalf of the Town, I want to thank the Corps for its help over these many years and to ask for your continued support.

Very truly yours,

William A. McNulty

William A. McNulty
Town Manager

cc: Board of Selectmen, Provincetown
Congressman Gerry E. Studds

Town of Provincetown
MASSACHUSETTS 02657
(617) 487-3900

April 30, 1986

Joseph L. Ignazio
Chief, Planning Division
424 Trapelo Rd.
Waltham, MA 02254-9149

Dear Mr. Ignazio:

The Town of Provincetown is applying for funding through the Economic Development Administration for the MacMillan Wharf Project. The project will include the construction of berthing piers and an unloading platform for commercial fishing. It also involves dredging in and around the pier.

EDA needs a response from the Corps of Engineers regarding its ability to fund such a project.

On behalf of the Town of Provincetown, I would like to request a letter from you stating your support of the project and your ability to fund the project.

Thanking you in advance for your consideration in this matter.

Very Truly Yours,

Michelle Jarusiewicz
Ass't to the Town Manager

cc: Mark Habel